# DEVELOPMENT IMPACT REPORT
# "CARDINAL PLACE" RESIDENTIAL SUBDIVISION
# AT ASSESSORS MAP 136, LOT 353 AND MAP 138 LOTS 376 TO 380
# ON CARDINAL STREET IN
# NEW BEDFORD, MASSACHUSETTS

**PREPARED FOR:**

**RICHARD HOPPS**
**302 ELM STREET**
**DARTMOUTH, MA 02748**

**PREPARED BY:**

**PRIME ENGINEERING, INC.**
**P.O. BOX 1088**
**LAKEVILLE, MASSACHUSETTS**

**NOVEMBER 13, 2013**
**REVISED DECEMBER 30, 2013**
**SECOND REVISION FEBRUARY 3, 2014**

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FIGURES - REDUCED SIZE PLANS

APPENDICES AND ATTACHMENTS

## 1.0 INTRODUCTION

It is proposed to construct a 320 foot long cul-de-sac roadway from the current southern terminus of Swallow Street in the Sassaquin Pond area of New Bedford. The purpose is to create a seven lot residential subdivision. Permits must be obtained from the New Bedford Planning Board under their subdivision control regulations and their Site Plan Review regulations as well as from the New Bedford Conservation Commission under the MA Wetland Protection regulations. This document has been prepared in support both of those permit applications.

## 2.0 PHYSICAL ENVIRONMENT

The property is a 6.8 acre wooded parcel south of Cardinal Street, which is a fifteen foot wide paper street created many years ago by the Board of Survey. The property runs from the current terminus of Swallow Street easterly to Tobey Street. The upland portion of the site, which is to be developed, is primarily mature white pine while the wetland portion, which will not be disturbed, is deciduous forest dominated by red maple. The topography is relatively flat with a peak elevation of 97 and a low point of 91 on the New Bedford datum.

The surficial soils are rated by the U.S. Soil Conservation Service as Whitman extremely stony, fine sandy loam which is hydrologic group "D." However, test pits conducted on September 27, 2013 in the presence of the New Bedford Conservation Commission peer reviewer, Scott Turner, revealed that almost all of the site consisted of permeable sand. There are no unusual geologic, archeological, scenic or historic features on this or abutting properties. There are no significant viewpoints, stone walls, trails or open space links. The site is not mapped as having habitat for rare or endangered species. There is a certified vernal pool south of the site on the site of the Pulaski School.

Since there are no significant archeological, scenic, historic features etc. the project will not have a negative impact on the physical environment. The eastern portion of the site is a red maple swamp which will not be disturbed or impacted. The north west portion of the site will be developed with a 320 foot long paved road bordered by six lots which vary in size from .184 acres to 2.86 acres.

## 3.0 PROPOSED DEVELOPMENT

It is proposed to construct a 320 foot long cul-de-sac roadway that meets the New Bedford Planning Board subdivision standards for roadways. In general, there will be a 24 foot wide paved roadway, bordered by six inch reveal vertical granite curbing, a narrow grass ribbon strip and a four foot wide concrete sidewalk, all in a forty foot wide roadway layout. Street trees, Washingtonian style lights and hydrants will be installed in the grass ribbon strip.

A municipal water main will be extended the full length of the proposed roadway, terminating in an autoflush hydrant. A storm drainage system will be installed at the terminus of the roadway with a grated manhole placed at the flushing hydrant in order to preclude icing when the hydrant flushes

in the winter. The storm system will discharge to a Stormceptor storm treatment system and then to a proposed retention basin which has been designed to infiltrate all of the runoff . As such, it will control both the quantity and quality of the storm runoff. The runoff from the lower portion of the road will be passed through an "Urban Green" brand tree box filter before being conveyed to a series of leach pits where it will be infiltrated.

The municipal sewer system will consist of a force main that discharges to a proposed doghouse manhole on the sewer main on Sassaquin Avenue. Each lot will have individual sewer ejectors that will pump the sewage into the sewer main.

The subdivision will also be provided with underground electric, telephone and cable as well as natural gas. All lots will have the requisite frontage and area and all dwellings will comply with set back requirements.

## 4.0 SURFACE AND SUBSURFACE WATER CONDITIONS

A drainage divide (ridge line) runs east and west along the site's northern property line. Both the surface water and the subsurface water flow south easterly and south westerly to a red maple swamp. The water in the swamp flows westerly through a culvert in Route 140 to a roadside channel on the west side of Route 140.

A report entitled "A Preliminary Evaluation of Sassaquin Pond and Its Watershed," dated November 1987 prepared by Baystate Environmental Consultants, Inc. for the New Bedford Planning Board determined that the surface and subsurface water from the subject site does not flow to Sassaquin Pond.

The on-site and off-site wetlands will not be impacted by the development because stormwater will be treated by a Stormceptor stormwater treatment system and be infiltrated into the ground. In addition, an average of a 25 foot width of no-disturb upland buffer zone to the wetlands will be provided.

Due to the high groundwater table, full basements are not viable. The dwellings shall be either slab on grade or raised ranches with walk-out lower levels in the rear.

It is proposed that fertilizers and pesticides will be prohibited in order not to negatively impact the wetlands.

On November 18, 1996, the Massachusetts Department of Environmental Protection (MADEP) issued the Stormwater Management Policy. The goal of this policy is to improve water quality and address water quantity problems, which are sometimes caused by development projects, through the implementation of performance standards for stormwater management. The project was designed to meet and exceed all relevant standards. The following section describes how each of these

standards will be achieved on this project by incorporating Best Management Practices (BMP's) into the design.

### 4.1 Untreated Stormwater - Standard 1

Standard 1 recommends that no new stormwater conveyance, such as storm drain outfalls, discharge untreated stormwater directly to wetlands or waterways of the Commonwealth. Flows from woods, fields and other undeveloped areas are to be considered uncontaminated, however, runoff from paved road surfaces should receive treatment prior to discharge. The road runoff from each home will be infiltrated on each lot. The proposed development will convey its roadway runoff to Stormceptor Treatment System. As such, DEP Standard 1 will be satisfied.

### 4.2 Post Development Peak Discharge Rates - Standard 2

Standard 2 prescribes that stormwater management systems be implemented in order to ensure that post-development peak rates of discharge do not exceed existing rates of runoff for standard two year and ten year design storms. In addition, the pre and post peak rates for the one hundred year storm must be evaluated to assure that there will not be increased off-site flooding. Based on the existing woods in fair to good hydrologic condition on a hydrologic "A" soil, the current hydrologic runoff curve number (RCN) is 38. The developed site will have an RCN of 54. As demonstrated in the drainage report in Appendix A, the proposed retention basin will reduce the peak rate of runoff for the full range of storms. Therefore, DEP Standard 2 will be satisfied.

### 4.3 Recharge to Groundwater - Standard 3

The annual recharge from the post development site will approximate the annual recharge from the pre-development conditions. Standard 3 of the DEP Stormwater Policy prescribes that the stormwater runoff volume to be recharged to groundwater should be determined using existing soil. According to the results of test pits, the surficial soils are Type A. The DEP Stormwater Policy requires that certain volume of runoff be infiltrated to groundwater based on the type of soil present and the amount of impervious area being generated by the proposed development. All of the roof runoff will be infiltrated and the driveway and roadway runoff will be infiltrated, therefore, standard 3 will be met.

### 4.4 Removal of 80% of Total Suspended Solids - Standard 4

The Stormceptor and deep sump catch basin will remove over 80% of suspended solids.

| **BMP** | TSS Removal Rate | Initial Pollution Load | Amount Removed | Remaining Load |
|---|---|---|---|---|
| Deep Sump Catch Basin | .25 | 1.0 | .25 | .75 |
| Stormceptor | .80 | .75 | .60 | .15 |
| Total Removed | | | 85% | |

Since 85% of the TSS will be removed, Standard 4 will be met.

### 4.5 Uses with Higher Potential Pollution Loads - Standard 5

The proposed development is not one that has potential for higher pollutant loads, therefore, DEP Standard 5 will be met.

### 4.6 Critical Areas - Standard 6

Standard 6 of the DEP Stormwater Policy seeks to protect critical areas. Critical areas are specifically designated Outstanding Resource Waters (ORW's) such as shell fish beds, swimming beaches, cold water fisheries and recharge areas for public water supplies. Such areas require the use of specific BMP's if they generate any pollutants. The proposed project will not discharge any pollutants to any of these areas, therefore, this standard is satisfied.

### 4.7 Redevelopment of Previously Developed Sites - Standard 7

Standard 7 applies to sites which have been previously developed and are being redeveloped. Diminished performance of BMP's is allowed in these areas. This project does not fall into this category.

### 4.8 Erosion and Sediment Control - Standard 8

An Erosion and Sediment Control Plan has been developed for this project and is included in the Construction drawings. These plans show the proposed locations for erosion control devices. The following supplemental provisions are also a part of this plan. A narrative is presented in Appendix B.

Erosion and Sediment Control measures which are proposed to be implemented during construction include the installation of silt fencing which has the bottom six inches buried in the ground. Any extra excavated soil which is not used to bury the base of the fence will be cast up gradient of the silt fence.

- Silt fence and haybales, if installed, shall be inspected after every major rainfall runoff event (over ½ inch depth of precipitation). All damaged or misaligned fences shall be immediately repaired. Silt shall be immediately removed from all areas of the silt fence when depth of accumulation reaches six inches.

- All exposed construction areas will be stabilized upon completion in order to minimize the time that these areas are unstabilized.

With the full impact of the measures presented on the Erosion Control Plan, along with the provisions stipulated above, Standard 8 will be satisfied.

## 4.9 Operation and Maintenance Plans - Standard 9

Standard 9 of the DEP Stormwater Policy prescribes the adoption of a formal operation and maintenance plan to ensure that the Stormwater management systems function properly as designed. The following is the proposed operation and maintenance plan for Mainline Solar Photovoltaic Panel Array:

- Owner: Richard Hopps
  302 Elm Street
  Dartmouth, MA 02748

- Parties responsible for Operation and Maintenance: Same as above

The stormwater management facilities were designed to require little or no intervention in the operation and to require little or no maintenance once the project is built and stable vegetative cover is established . However, the drainage improvements shall be subject to the following maintenance schedule:

1. Mowing: The grass in the infiltration (retention) basin shall be mowed at least once a year during the growing season.
2. Debris: All debris and litter are to be removed from the site.
3. Reseeding: Areas that have excessive erosion or slumping are to be regraded and seeded (with canary grass or tall fescue grass) during the spring or fall growing seasons as needed.

A permanent Operation and Maintenance Program is enclosed in Appendix C.

### 4.10 Statement of Compliance - Standard 10

As presented above, this stormwater design meets all of the relevant standards contained in the DEP Stormwater Design Policy. An executed form certifying to this fact is attached in the checklist for

Stormwater Report which is enclosed as Appendix D and an interim illicit discharge statement is presented in Appendix E.

## 5.0 CIRCULATION SYSTEMS

The Institute of Transportation Engineers Trip Generation Manual projects that the proposed development will have an average of 68 trip ends per weekday with 34 leaving and 34 arriving. At the morning peak hour (between 7 and 9 am) there will be a projected 6 trip ends per hour with 4 leaving and 2 returning. A the evening peak hour (between 4 and 6 pm) there will be a projected 7 trip ends with 5 arriving and 2 leaving.

On Saturdays the daily number of trip ends is projected to be 72 trip ends with 36 leaving and 36 arriving. The peak hour on Saturday is projected to be 7 trip ends with 4 arriving and 3 leaving.

On Sundays the projected daily number of trip ends is projected to be 62 with 31 arriving and 31 leaving. The peak hour on Sundays is projected to be 6 trip ends with 3 arriving and 3 leaving.

The heaviest projected traffic is thus projected to be the weekday evening peak hours where one vehicle will be leaving, on average, every 30 minutes and one vehicle will be arriving, on average, every 12 minutes. This extremely light traffic is not projected to have any significant impact on the neighboring roadway system.

## 6.0 SUPPORT SYSTEMS

The following section presents the infrastructures that will support the proposed development.

### 6.1 Water Supply

An eight inch diameter cement lined ductile iron main will be installed in Swallow Street from the eight inch diameter cast iron main in Sassaquin Avenue to the intersection of Cardinal Street and then along the full length of Ava's Way. A hydrant will be installed at the terminus.

### 6.2 Sewer System

Each dwelling will have an exterior grinder pump station that will eject the sewage into a 2.5 inch diameter force main in Ava's Way and in Swallow Street. The force main will discharge into a dog house sewer manhole that will be installed on the Sassaquin Avenue gravity sewer main.

### 6.3 Refuse Disposal

Refuse collection will be done at curbside by the New Bedford Department of Public Infrastructure. The refuse will be disposed in the Crapo Hill landfill.

### 6.4 Emergency Access

The roadway has been designed to accommodate the City's fire vehicles. The nearest fire station is on Acushnet Avenue approximately one mile from Sassaquin Avenue.

### 6.5 Recreation

There are no public parks in the Sassaquin area, however, Sassaquin Pond is a recreational feature and the woods to the south of the proposed development allows for passive recreation.

### 6.6 Schools

It is unknown how many school age children the seven lot subdivision will generate, however, it is not projected to bring children in from surrounding towns but rather to relocate children from elsewhere in New Bedford.

## 7.0 SITE PLAN REVIEW STANDARDS

Section 5470 of the New Bedford Comprehensive Zoning Ordinance presents the criteria that are to be reviewed under Site Plan Review. This section presents how these criteria are being met.

### 7.1 Site Disturbance

There will be only a moderate amount of site disturbance. The volume of earthwork cuts and fills has been balanced and minimized. On average only the front halves of the lots will be disturbed. There is no proposed wetland displacement, no stone walls will be disturbed. The stormwater will be controlled by the proposed detention basin. The erosion and sedimentation plan will control soil erosion and none of the proposed improvements will cause a threat of air pollution.

### 7.2 Pedestrian and Vehicle Safety

The road has been designed to provide sidewalks on both sides. Vertical granite curb and a grass ribbon strip will be provided to separate the vehicle roadway from the pedestrian sidewalks. The

road has been designed with excellent horizontal and vertical sight distances. It has moderate grades and meets all safety standards.

### 7.3 Scenic Views

The proposed improvements will not obstruct any existing scenic views from any publicly accessible locations.

### 7.4 Visual Intrusion

The are no proposed outdoor storage or outdoor service areas that will be viewed from public ways or public premises. The only parking proposed are single family residential driveways.

### 7.5 Glare

The proposed street lights are Washingtonian style fixtures which provide glare-free indirect lighting. The street layout meets New Bedford roadway standards, therefore, vehicle headlight glare is not projected to be an issue.

### 7.6 Character, Material and Scale of Buildings

The proposed dwellings will be moderately sized, one to two story, wood framed structures that have shingles and/or siding in keeping with the neighboring dwellings.

### 7.7 Groundwater Contamination

The dwellings will be served by municipal sewer, therefore, there will be no on-site wastewater disposal systems. There is no proposed use, storage, handling or containment of solid or liquid hazardous waste. Non-hazardous solid waste will be collected by municipal collection once the roadway is accepted as a public way.

### 7.8 Zoning Compliance

The proposed development will comply with all provisions of the New Bedford zoning ordinance without the need for any variance**.**

### 7.9 Minimize Damage to Public Ways

None of the proposed construction or subsequent residential use will result in damage to the existing public ways.

## 7.10 Traffic Circulation

The 24 foot wide paved roadway with the cul-de-sac terminus will provide for orderly and reasonable internal circulation thereby protecting public safety. The proposed road will not interfere with access to the adjoining public ways or to the circulation of traffic on the public ways in general.

## FIGURES

**REDUCED SIZE PLAN SET**

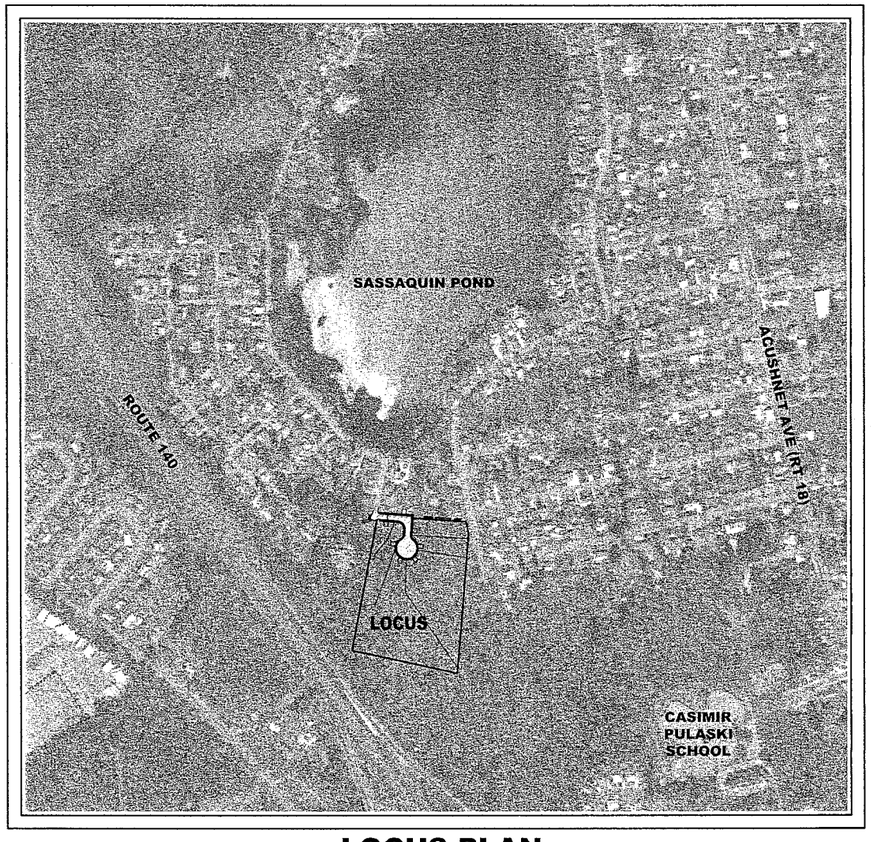
# CARDINAL PLACE

## DEFINITIVE PLAN FOR A RESIDENTIAL SUBDIVISION

## CARDINAL STREET & AVA'S WAY, NEW BEDFORD, MASSACHUSETTS

**OWNERS:**
THOMAS GRENIER
560 ROCKDALE AVE.
NEW BEDFORD, MASSACHUSETTS

**APPLICANT:**
RICHARD HOPPS
302 ELM STREET
DARTMOUTH, MASSACHUSETTS




**LOCUS PLAN**
**SCALE: 1"=300'±**

### SCHEDULE OF DRAWINGS

| SHEET NUMBER | PLAN TITLE |
|---|---|
| CS1 | COVER SHEET |
| DF1 | DEFINITIVE LOTTING SHEET |
| EX1 | EXISTING CONDITIONS PLAN |
| GD1 | GRADING AND DRAINAGE PLAN |
| UT1 | UTILITY PLAN |
| RP1 | ROAD PLAN AND PROFILE |
| DE1-2 | DETAIL SHEET |
| LP1 | LANDSCAPE AND LIGHTING PLAN |
| ER1-2 | EROSION CONTROL PLANS |

### REQUESTED WAIVERS:

THE FOLLOWING WAIVERS ARE HEREBY REQUESTED:

1. A WAIVER TO ELIMINATE THE CUL-DE-SAC ISLAND.
2. A WAIVER TO ALLOW FOR A 40-FOOT RIGHT OF WAY.
3. A WAIVER TO ALLOW FOR A 24' PAVEMENT WIDTH.

**APRIL 22, 2013**
**REVISED FEBRUARY 3, 2014**

**PREPARED BY:**

PRIME ENGINEERING INC
CIVIL ENGINEERING-LAND SURVEYING-ENVIRONMENTAL ASSESSMENT
P.O. BOX 1088, 350 BEDFORD STREET, LAKEVILLE, MA 02347
TEL: 508.947.0050 FAX: 508.947.2004

O:\PROJECTS\New Bedford\Swallow Street\Map 136-2 Lot 353 Swallow Street\ENGINEERING\Definitive\BASE.dwg

CHEROKEE STREET (PUBLIC - 50' WIDE)

PEQUOT STREET (PUBLIC - 50' WIDE)

TOBEY (PUBLIC - 50' WIDE) STREET

SB/LP&PIN

N 13° 03' 19" W 7.95'

N 76° 56' 41" E 25.00'

S 13° 03' 19" E 50.81'

24.66'

85.74'

S 04° 45' 08" W 627.38'

493.09'

23.88'

N/F
CITY OF NEW BEDFORD
MAP 136A - LOT 572

N/F
CITY OF NEW BEDFORD
PULASKI SCHOOL
MAP 136A - LOT 379

APPLICANT

RICHARD HOPPS
302 ELM STREET
DARTMOUTH, MA 02748

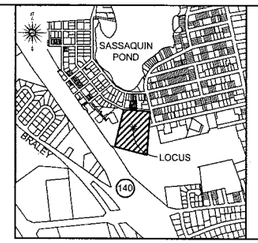
OWNER
THOMAS GRENIER
560 ROCKDALE AVENUE
NEW BEDFORD, MA 02740

DIMENSIONAL REQUIREMENTS

| | |
|---|---|
| MINIMUM LOT AREA | 8000 S.F. |
| MINIMUM FRONTAGE | 75 FT |
| MINIMUM FRONT SETBACK | 15 FT |
| MINIMUM REAR SETBACK | 30 FT |
| MINIMUM SIDE SETBACK | 12 FT AND 10 FT |

TABLE OF FRONTAGES AND AREAS

| | FRONTAGE | LOT AREA |
|---|---|---|
| MIN. REQUIRED | 75' | 8,000 S.F. |
| LOT 1 | 75.00' | 8,796 S.F. |
| LOT 2 | 163.76' | 26,427 S.F. |
| LOT 3 | 75.00' | 109,896 S.F. |
| LOT 4 | 75.00' | 88,891 S.F. |
| LOT 5 | 75.00' | 17,274 S.F. |
| LOT 6 | 76.55' | 18,487 S.F. |
| LOT 7 | 75.10' | 10,804 S.F. |




LOCUS
SCALE: 1" = 1000'

FOR REGISTRY USE ONLY

I HEREBY CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMANCE WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS

COMMONWEALTH OF MASSACHUSETTS
BERNARD N. PERROTTY No. 46986 REGISTERED PROFESSIONAL LAND SURVEYOR

2/3/2014
DATE

BERNARD N. PERROTTY, P.L.S.

NOTES:

1. THE SUBJECT PROPERTY IS SHOWN ON THE CITY OF NEW BEDFORD ASSESSORS' MAP 136 AS LOT 353.

2. FOR TITLE REFERENCE TO THE SUBJECT PROPERTY REFER TO DEED BOOK 5380, PAGE 116 ON FILE AT THE BRISTOL COUNTY REGISTRY OF DEEDS.

3. THE SUBJECT PROPERTY IS ZONED "RESIDENTIAL A" AS SHOWN ON THE ZONING MAP FOR THE CITY OF NEW BEDFORD.

4. THE SUBJECT PROPERTY IS LOCATED IN ZONE X (UNHATCHED), AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON THE FLOOD INSURANCE MAP FOR BRISTOL COUNTY, MASSACHUSETTS, PANEL 377 OF 550, MAP NUMBER 25005-C-0377F, EFFECTIVE DATE: JULY 7, 2009.

5. THE EASEMENTS SHOWN HEREON ARE DEFINED AS FOLLOWS:

EASEMENT 1-A IS A DRAINAGE EASEMENT ON LOT 1.

EASEMENT 2-A IS A DRAINAGE EASEMENT ON LOT 2.

EASEMENT 2-B IS A DRAINAGE EASEMENT ON LOT 2.

EASEMENT 3-A IS A DRAINAGE EASEMENT ON LOT 3.

EASEMENT 4-A IS A DRAINAGE EASEMENT ON LOT 4.

EASEMENTS AU-1 AND AU-2 ARE EASEMENTS THAT HAVE BEEN GRANTED BY THE OWNER OF THE SWALLOW STREET EXTENSION TO CONSTRUCT A ROADWAY AND PROVIDE UTILITIES.

NEW BEDFORD PLANNING BOARD
APPROVED UNDER THE SUBDIVISION CONTROL LAW

DATE: _____

N/F
DANIEL P. & KELLY A. STOCKBARGER
1145 TOBEY ST
MAP 138 - LOT 389

N/F
CHARLES J. & ELAINE T. GENDREAU - TRUSTEE
1151 TOBEY ST
MAP 138 - LOT 385

CARDINAL STREET (EXISTING PRIVATE - 15' WIDE)

N 65° 48' 04" W 331.39'

286.79'

N 85° 33' 58" W 251.64'

S 81° 02' 56" E 216.73'

N/F
MAURICE J. RICHARD
1156 SASSAQUIN AVE
MAP 138 - LOT 383

**LOT 6**
18,487 SQ.FT.
0.424 AC. ±
UPLAND AREA
11,242 SQ.FT.
0.258 AC. ±

**LOT 5**
TOTAL AREA
17,274 SQ.FT.
0.397 AC. ±
UPLAND AREA
7,826 SQ.FT.
0.180 AC. ±

**LOT 4**
TOTAL AREA
88,891 SQ.FT.
2.041 AC. ±
UPLAND AREA
14,707 SQ.FT.
0.338 AC. ±

N 34° 47' 44" W 408.45'

S 00° 17' 20" E 117.62'

1158 CARDINAL STREET
REMAINS OF EXISTING DWELLING

N/F
GEORGE & BARBARA M. MENDONCA
1170 SASSAQUIN AVE
MAP 138 - LOT 394

1156 CARDINAL STREET
EXISTING DWELLING

**LOT 7**
10,804 SQ.FT
0.248 AC. ±
ALL UPLAND
MAP 138 - LOTS 376, 377, 378, 379, 380

EXISTING SHED

4.21'
N 74° 40' 17" E

N 10° 54' 26" E 110.62'

15.00'
S 04° 11' 56" W 40.00'

N 04° 11' 56" E 76.55'
S 04° 11' 56" W 51.55'

L=19.84'
R=20.00'
Δ=56°49'04"

L=55.38'Δ=81°00'11"

AVA'S WAY
(VARIABLE WIDTH)

L=75.00'Δ=82°38'17"

L=288.47'
L=9.61'
Δ=10°35'14"

L=2.46'
Δ=2°42'49"

48.70'
S 00° 36' 24" W

N 01° 35' 21" E 146.35'

N 00° 36' 24" E 61.74'

EASEMENT 4-A
1,545 SQ.FT.
0.038 AC. ±

S 29° 57' 45" E 52.34'

S 60° 31' 16" W 15.00'

S 29° 57' 45" E 30.12'

S 75° 46' 21" W 4.78'

N 29° 57' 45" W 21.15'

S 60° 02' 14" W 15.00'

EASEMENT 3-A
3,474 SQ.FT.
0.080 AC. ±

N 14° 13' 39" E 60.77'

S 75° 46' 21" W 61.55'

N 17° 00' 14" W 43.84'

**LOT 3**
TOTAL AREA
109,896 SQ.FT.
2.523 AC. ±
UPLAND AREA
47,497 SQ.FT.
1.090 AC. ±

N 77° 40' 56" W 429.25'

N 85° 48' 04" W 180.35'

S 85° 48' 04" E 155.55'

S 85° 48' 04" E 105.87'

S 85° 48' 04" E 80.55'

N 85° 48' 04" W 45.66'

EASEMENT 2-A
725 SQ.FT.
0.017 AC. ±

S 23° 35' 18" W 64.75'

14.25'
S 04° 11' 56" W 70.85'

**LOT 1**
TOTAL AREA
8,796 SQ.FT.
0.202 AC. ±
ALL UPLAND

EASEMENT 1-A
2,007 SQ.FT.
0.046 AC. ±

S 41° 39' 26" W 76.98'

**LOT 2**
TOTAL AREA
26,427 SQ.FT.
0.607 AC. ±
UPLAND AREA
16,207 SQ.FT.
0.372 AC. ±

N 19° 24' 42" E 256.23'

EASEMENT 2-B
1,081 SQ.FT.
0.025 AC. ±

S 10° 54' 26" W 28.24'

S 10° 54' 26" W 52.96'

S 79° 05' 34" W 52.96'

N 10° 54' 26" E 588.98'

219.96'

N 17° 24' 55" E 70.55'

198.27'

50.28'
N 79° 47' 34" W

N 10° 54' 26" E 143.69'

170.75'

S 10° 54' 26" W 143.69'

10.41'
S 79° 05' 34" E

20.41'
N79° 05' 34"W

15.10'
25.17'
40.27'
10.07'

CB/DH/FD (HELD)

SWALLOW (PUBLIC - 30' WIDE) STREET

SITE BENCHMARK
TOP OF CB/DH
ELEV. = 94.70
(BASED ON CITY OF NEW BEDFORD ORIOLE STREET SEWER PLAN)

□ = PROPOSED GRANITE BOUND LOCATION

CARDINAL (PUBLIC - 30' WIDE) STREET

EASEMENTS
AU-1 & AU-2
(TO BE RECORDED)

SWALLOW STREET EXT.
(40' WIDE-P.B.157, PG.8)

L=156.40' R=112.07' Δ=79°57'42"

LOT 10
P.B. 157 - PG. 8
19,077 SQ.FT.
0.438 AC. ±

PLAN REFERENCES

| | |
|---|---|
| P.B. 11, PG. 20 | P.B. 122, PG. 100 |
| P.B. 14, PG. 19 | P.B. 125, PG. 12 |
| P.B. 51, PG. 55 | P.B. 128, PG. 146 |
| P.B. 53, PG. 50 | P.B. 131, PG. 67 |
| P.B. 66, PG. 22 | P.B. 135, PG. 106 |
| P.B. 82, PG. 35A | P.B. 139, PG. 44 |
| P.B. 82, PG. 35B | P.B. 144, PG. 102 |
| P.B. 86, PG. 33 | P.B. 145, PG. 106 |
| P.B. 86, PG. 88 | P.B. 147, PG. 109 |
| P.B. 92, PG. 121 | P.B. 152, PG. 32 |
| P.B. 105, PG. 34 | P.B. 157, PG. 8 |
| P.B. 118, PG. 30 | |
| P.B. 122, PG. 15 | |

LAYOUT OF CARDINAL STREET
LAYOUT OF SWALLOW STREET
LAYOUT OF TOBEY STREET
BOARD OF SURVEY PLAN NO.7A, SHOWING PROPOSED DISCONTINUANCE OF STREETS IN THE SYLVAN GROVE AREA, DATED: AUGUST 20, 1963, SCALE: 1 IN. = 100 FT

COMMONWEALTH OF MASSACHUSETTS
BERNARD N. PERROTTY No. 46986 REGISTERED PROFESSIONAL LAND SURVEYOR

2/3/14

F.S.B./FD BY MASS DPW
(SEE MASS. DPW FIELD BOOK #15050, PGS. 34-35.)

N/F
CITY OF NEW BEDFORD
PULASKI SCHOOL
MAP 136A - LOT 379

NO ACCESS
ROUTE 140 (1956 STATE HIGHWAY)
(L.O.-NO.4403)

# DEFINITIVE PLAN OF CARDINAL PLACE

IN

## NEW BEDFORD, MASSACHUSETTS

PREPARED FOR

## RICHARD HOPPS

DATE: DECEMBER 27, 2013 SCALE: 1"=30'
REVISION DATE: JANUARY 7, 2014
REVISION DATE: FEBRUARY 3, 2014

0' 30' 60' 90'

PREPARED BY:


PRIME ENGINEERING INC
CIVIL ENGINEERING-LAND SURVEYING-ENVIRONMENTAL ASSESSMENT
P.O. BOX 1088, 350 BEDFORD STREET, LAKEVILLE, MA 02347
TEL: 508.947.0050 FAX: 508.947.2004

CHEROKEE STREET

TOBEY STREET

S 04° 45' 08" W 627.38'

S 15° 03' 19" E 50.81'

CARDINAL STREET (EXISTING PRIVATE 15' WIDE)

S 08° 48' 04" E 394.20'

N 77° 40' 36" W 429.25'

N 79° 47' 34" W 50.29'

N 10° 54' 26" E 614.15'

WF-B27 WF-B26 WF-B25 WF-B24 WF-B23 WF-B22 WF-B21 WF-B20 WF-B19 REVISED WF-B18 REVISED WF-B17 WF-B16 WF-B15 WF-B14 WF-B13 WF-B12 WF-B11 WF-B8 WF-B7

WF-7 WF-6 WF-5 WF-4 WF-3 WF-2 WF-1 WF-A1 WF-A2 WF-5A WF-6A WF-7A WF-8A WF-9A WF-1A

WETLAND
UPLAND

UPLAND
WETLAND

25' NO-DISTURB ZONE

100' BUFFER ZONE

TP-1 REDOX @ 36" ESHGW = 91.0

TP-2 REDOX @ 56" ESHGW = 91.8

TP-3 REDOX @ 43" ESHGW = 91.4

TP-4 REDOX @ 8" ESHGW = 93.3

TP-5 REDOX @ 50" ESHGW = 91.2

TP-6A REDOX @ 58" ESHGW = 89.7

TP-6B REDOX @ 14" ESHGW = 89.7

TP-7 REDOX @ 61" ESHGW = 90.5

SITE BENCHMARK
TOP OF CB/DH
ELEV. = 94.70
(BASED ON CITY OF NEW BEDFORD ORIOLE STREET SEWER PLAN)

EXISTING CB
RIM=92.89
8" INV.OUT=91.34

SWALLOW STREET

EXISTING INLET
RIM=93.34
8" INV.IN=91.39
12"RCP INV.OUT=91.46

CARDINAL STREET (30' WIDE)

EXISTING GRAVEL DRIVE

30 0 30 60 90

Scale 1" = 30'

**NEW BEDFORD PLANNING BOARD**

APPROVED UNDER THE SUBDIVISION CONTROL LAW REQUIRED

DATE:

| REV. | DATE | DESCRIPTION | BY | APP. |
|---|---|---|---|---|
| 5 | 2/3/14 | REVISED ROAD LAYOUT | EKW | RJR |
| 4 | 1/7/14 | RESPONSE TO CON-COM COMMENTS | EKW | RJR |
| 3 | 11/26/13 | RESPONSE TO COMMENTS | EKW | RJR |
| 2 | 11/13/13 | RESPONSE TO DPI COMMENTS | EKW | RJR |
| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: EXISTING CONDITIONS

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS

SCALE: 1" = 30'
DATE: APRIL 22, 2013
DRAWN BY: JLB/RMF
DESIGNED BY: JLB/RMF
CHECKED BY: RJR
APPROVED BY: RJR
SHEET NO.: EX1
PROJECT NO.: 1931-0101

RICHARD J. RHEAUME No. 39273 CIVIL REGISTERED PROFESSIONAL ENGINEER


- CIVIL ENGINEERING
- LAND SURVEYING
- ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING LLC

P.O. BOX 1088
350 BEDFORD ST.
LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004


O:\PROJECTS\New Bedford\Swallow Street\Map 136-2 Lot 353 Swallow Street\ENGINEERING\Definitive\BASE.dwg

CHEROKEE STREET

TOBEY STREET

CARDINAL STREET (EXISTING PRIVATE 15' WIDE)

LOT 5

LOT 6

LOT 4

LOT 3

LOT 2

LOT 1

WETLAND
UPLAND

25' NO DISTURB ZONE

100' BUFFER ZONE

ROOF INFILTRATORS
(TYPICAL). TWO
CHAMBERS PER HOUSE

CB-2
F&G = 95.10
12" INV. OUT = 92.10

HW-1
12" RCP INV = 91.00

STC-1 (450)
RIM = 96.20
12" INV. IN = 91.60
12" INV. OUT = 91.35

SPILLWAY
ELEVATION = 94.50

SEE DETAIL SHEET DET

100' BUFFER ZONE

AVA'S WAY

5 X 6' DIAMETER
LEACHING PITS
RIM = 97.2
12" INV IN. = 92.80
BOTTOM ELEV = 92.50

CB-1
F&G = 95.10
12" INV. OUT = 92.10

STC-2 (450)
RIM = 96.8
12" INV. IN = 93.11
12" INV. OUT = 92.86

CB-3
F&G = 96.00
12" INV. OUT = 93.40

CB-4
F&G = 96.00
12" INV. OUT = 93.40

TRENCH GRATE
NF 4999-CX TYPE A
F&G = 93.60
6" INV. OUT = 93.10

EXISTING CB
RIM=92.89
8" INV.OUT=91.34

CARDINAL ST

SWALLOW STREET

STC-3 (450)
RIM = 96.5
6" INV. IN = 93.00
12" INV. OUT = 92.75

FES 1
12" RCP INV = 92.45

EXISTING INLET
RIM=93.34
6" INV.IN=91.39
12"RCP INV.OUT=91.46

EXISTING DRIVEWAY

100' BUFFER ZONE

N

NOTES:
1. THE LOT GRADING AND DRIVEWAYS SHOWN ARE CONCEPTUAL AND ARE SHOWN IN ORDER TO DEMONSTRATE HOW THE DRAINAGE SYSTEM WILL FUNCTION AND IN ORDER TO DESIGN THE RETENTION BASIN.
2. SEPARATE NOTICES OF INTENT WILL BE FILED FOR EACH DWELLING FOR WORK THAT IS WITHIN 100' OF WETLAND RESOURCE AREAS.
3. ALL DRIVEWAY APRONS, SIDEWALKS, AND WHEELCHAIR RAMPS TO BE PORTLAND CEMENT CONCRETE. SIDEWALKS TO TERMINATE WITH WHEELCHAIR RAMPS (SEE PLAN).
4. ACCESS DRIVE TO BASIN TO BE 12" OF CRUSHED STONE MIXED WITH LOAM, COMPACTED AND SEEDED.
5. ROOF GUTTERS TO DISCHARGE TO ROOF INFILTRATORS, TWO CHAMBERS PER HOUSE (SEE DETAIL)
6. ALL DRAINAGE PIPING TO BE 12" CLASS V RCP UNLESS OTHERWISE SPECIFIED.
7. WITHIN THE LIMITS OF CARDINAL STREET, SWALLOW STREET TO BE BUILT IN ACCORDANCE WITH CITY OF NEW BEDFORD SUBDIVISION REGULATIONS

**NEW BEDFORD PLANNING BOARD**

APPROVED UNDER THE SUBDIVISION CONTROL LAW REQUIRED

DATE:

*LEGEND*

| DESCRIPTION | EXISTING | PROPOSED |
|---|---|---|
| CATCH BASINS | ⊞ ⊕ | ◉ CB 2 |
| DRAIN MANHOLE | | ● DMH |
| INTERMEDIATE CONTOUR | 29 | 30 |
| INDEX CONTOUR | 30 | |
| DRAIN LINE | | |
| CHAIN LINK FENCE | | |
| | | |
| TREELINE | | |

| REV. | DATE | DESCRIPTION | BY | APP. |
|---|---|---|---|---|
| 5 | 2/3/14 | REVISED ROAD LAYOUT | EKW | RJR |
| 4 | 1/7/14 | RESPONSE TO CON-COM COMMENTS | EKW | RJR |
| 3 | 11/26/13 | RESPONSE TO COMMENTS | EKW | RJR |
| 2 | 11/13/13 | RESPONSE TO DPI COMMENTS | EKW | RJR |
| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: GRADING AND DRAINAGE SHEET

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS

SCALE: 1" = 30'
DATE: APRIL 22, 2013
DRAWN BY: JLB/RMF
DESIGNED BY: JLB/RMF
CHECKED BY: RJR
APPROVED BY: RJR
SHEET NO.: GD1
PROJECT NO.: 1931-0101


• CIVIL ENGINEERING
• LAND SURVEYING
• ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING INC.

P.O. BOX 1088
350 BEDFORD ST.
LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004


REGISTERED PROFESSIONAL ENGINEER No. 30373 RJR

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NOTES:

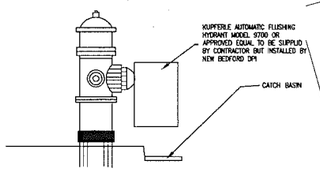
1. LOW PRESSURE SEWER SYSTEM AND GRINDER PUMPS SHALL MEET CITY OF NEW BEDFORD AND ENVIRONMENTAL ONE SPECIFICATIONS

2. THE OWNER/DEVELOPER MUST FILE THE COMPLIANCE CERTIFICATION (FORM BRP WP 72) WITH MADEP FOR THE MINOR SEWER MAIN EXTENSION.

3. CURB STOPS FOR WATER SERVICE TO BE LOCATED 1.5' FROM FACE OF CURB OR EDGE OF PAVEMENT, AS SHOWN ON PLAN.

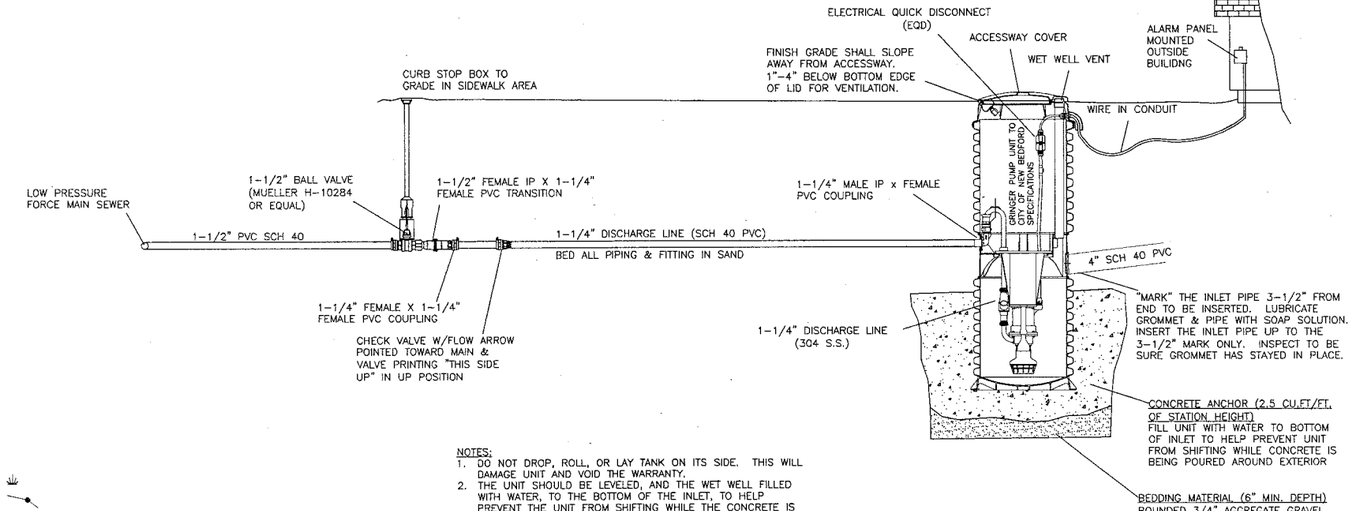
4. WATER SERVICES FROM CURB STOP TO HOUSE ARE SHOWN FOR PLANNING PURPOSES ONLY. WATER SERVICE TO BE DESIGNED AT TIME OF INDIVIDUAL HOUSE LOT DESIGNS.

5. WITHIN THE LIMITS OF AVA'S WAY, SWALLOW STREET TO BE BUILT IN ACCORDANCE WITH CITY OF NEW BEDFORD SUBDIVISION REGULATIONS




FIRE FLUSH DRAIN DETAIL

NOT TO SCALE




NOTES:
1. DO NOT DROP, ROLL, OR LAY TANK ON ITS SIDE. THIS WILL DAMAGE UNIT AND VOID THE WARRANTY.
2. THE UNIT SHOULD BE LEVELED, AND THE WET WELL FILLED WITH WATER, TO THE BOTTOM OF THE INLET, TO HELP PREVENT THE UNIT FROM SHIFTING WHILE THE CONCRETE IS BEING POURED.
3. "OATLEY" (DARK GREEN LABEL) ALL WEATHER CEMENT FOR PVC AND FITTINGS IS TO BE USED, EXCEEDS ASTM D-2564.
4. ELECTRICAL WIRING PER STATE AND LOCAL CODES.
5. 1-1/4" DIAMETER SCHEDULE 40 PRESSURE PIPE MUST HAVE MINIMUM PRESSURE RATING OF 370 PSI WITH A CELL CLASS OF 12454-B.

GRINDER PUMP DETAIL

N.T.S.




**NEW BEDFORD PLANNING BOARD**

APPROVED UNDER THE SUBDIVISION CONTROL LAW REQUIRED

DATE:

*LEGEND*

| DESCRIPTION | EXISTING | PROPOSED |
|---|---|---|
| CATCH BASINS | ⊞ ⊕ | ◉ CB 2 |
| DRAIN MANHOLE | | ● DMH |
| INTERMEDIATE CONTOUR | 29 | 30 |
| INDEX CONTOUR | 30 | |
| DRAIN LINE | | |
| | | |
| | | |
| TREELINE | | |

| REV. | DATE | DESCRIPTION | BY | APP. |
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| 2 | 11/13/13 | RESPONSE TO DPI COMMENTS | EKW | RJR |
| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: UTILITY PLAN

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS


• CIVIL ENGINEERING
• LAND SURVEYING
• ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING

P.O. BOX 1088
350 BEDFORD ST.
LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004


| | |
|---|---|
| SCALE: | 1" = 30' |
| DATE: | APRIL 22, 2013 |
| DRAWN BY: | JLB/RMF |
| DESIGNED BY: | JLB/RMF |
| CHECKED BY: | RJR |
| APPROVED BY: | RJR |
| SHEET NO. | UT1 |
| PROJECT NO. | 1931-0101 |

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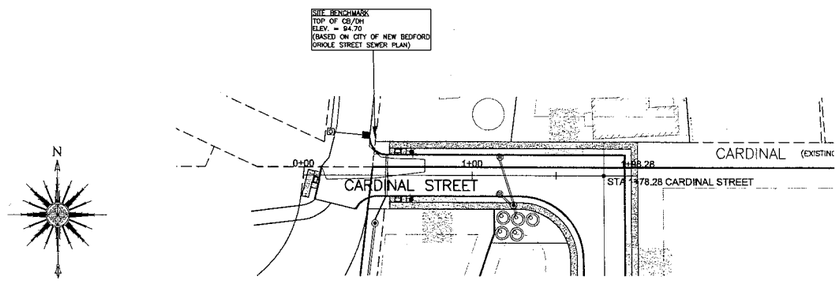
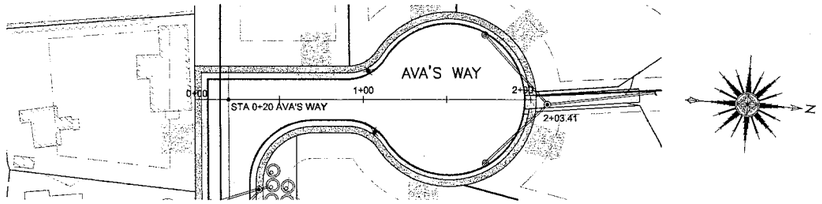
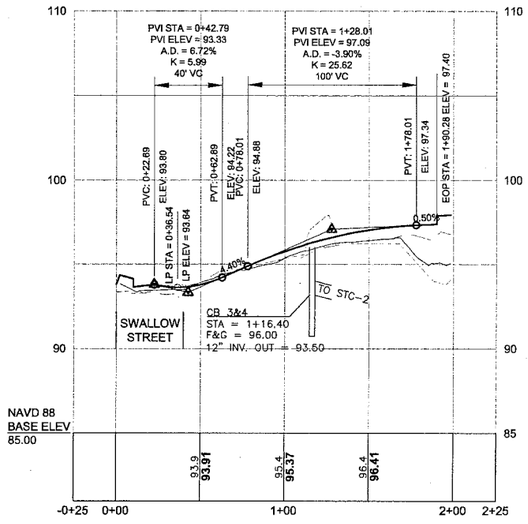
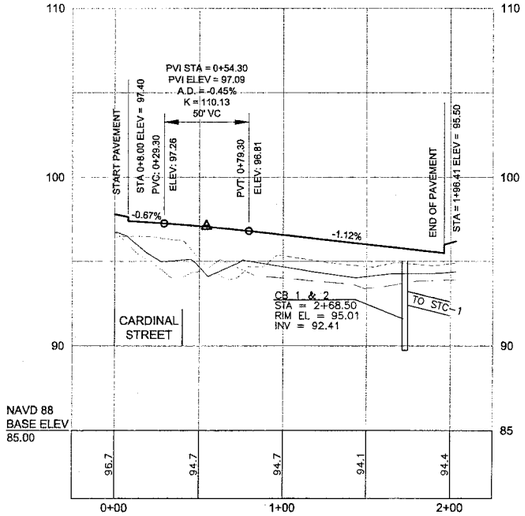



CARDINAL STREET PLAN AND PROFILE

SCALES:
1" = 40' HOR
1" = 4' VER




AVA'S WAY PLAN AND PROFILE

SCALES:
1" = 40' HOR
1" = 4' VER

| REV. | DATE | DESCRIPTION | BY | APP. |
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| 3 | 11/26/13 | RESPONSE TO COMMENTS | EKW | RJR |
| 2 | 10/29/13 | RESPONSE TO DPI COMMENTS | EKW | RJR |
| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: ROADWAY PLAN AND PROFILE

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS


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FAX: 508.947.2004


| | |
|---|---|
| SCALE: | AS NOTED |
| DATE: | 6/28/10 |
| DRAWN BY: | RMF |
| DESIGNED BY: | RMF |
| CHECKED BY: | RJR |
| APPROVED BY: | RJR |
| SHEET NO. | RP1 |
| PROJECT NO. | 1931-0101 |

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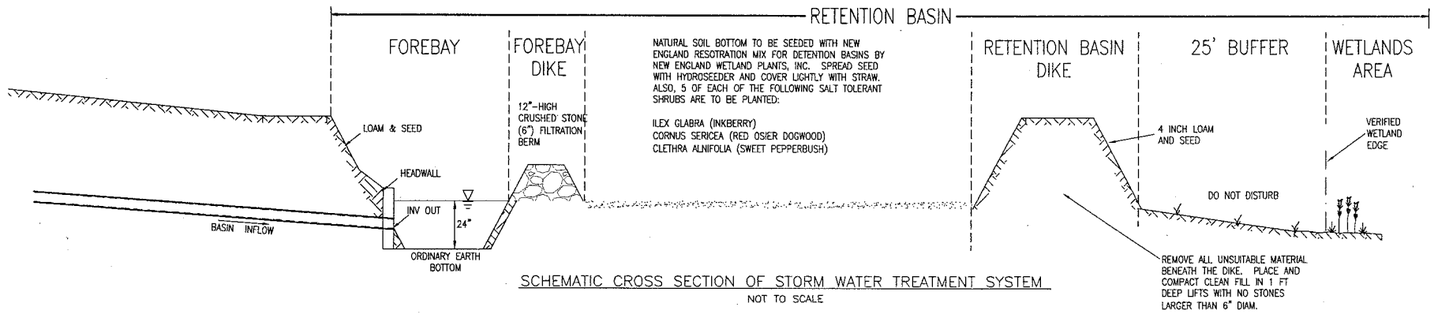
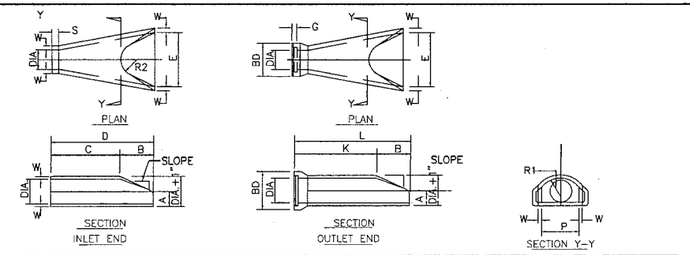



SCHEMATIC CROSS SECTION OF STORM WATER TREATMENT SYSTEM

NOT TO SCALE

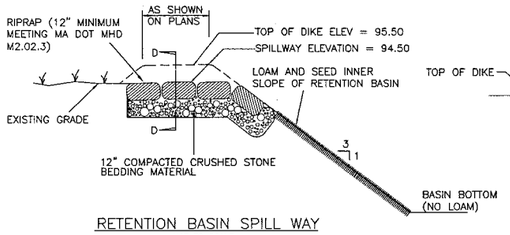



| DIA. | W | A | B | C | D | E | BD | K | L | P | DIA. +1" | R1 | R2 | S | G | SLOPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12" | 2" | 4" | 2'-0" | 4'-07/8" | 6'-1 3/4" | 2'-0" | 20" | 4'-6 1/8" | 6'-6 1/8" | 19 13/16" | 13" | 10 1/2" | 9" | 4" | 2 1/2" | 3:1 |
| 15" | 2 1/4" | 6" | 2'-3" | 3'-10" | 6'-1 1/2" | 2'-6" | 24" | 4'-3 11/16" | 6'-6 11/16" | 24 5/16" | 16" | 12 1/2" | 11" | 4" | 2 1/2" | 3:1 |
| 18" | 2 1/4" | 9" | 2'-3" | 3'-10" | 6'-1" | 3'-0" | 28" | 4'-3 7/8" | 6'-6 7/8" | 29" | 19" | 15 1/2" | 12" | 4" | 2 3/4" | 3:1 |
| 21" | 2 1/4" | 9" | 2'-11" | 3'-2" | 6'-1" | 3'-6" | 32" | 3'-8 5/16" | 6'-7 5/16" | 31 5/8" | 22" | 16 1/2" | 13" | 4" | 2 3/4" | 3:1 |
| 24" | 3" | 9 1/2" | 3'-7 1/2" | 2'-6" | 6'-1" | 4'-0" | 36" | 3'-0 1/2" | 6'-8" | 33 3/16" | 25" | 16 13/16" | 14" | 4" | 3" | 3:1 |

FOR BELL AND SPIGOT PIPE

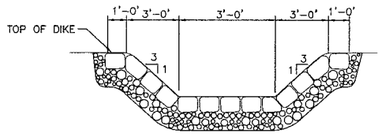
REINFORCED CONCRETE PIPE FLARED END

NOT TO SCALE



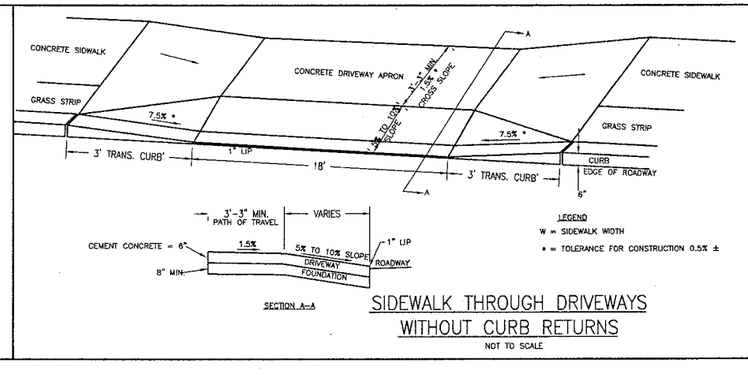

RETENTION BASIN SPILL WAY

NOT TO SCALE



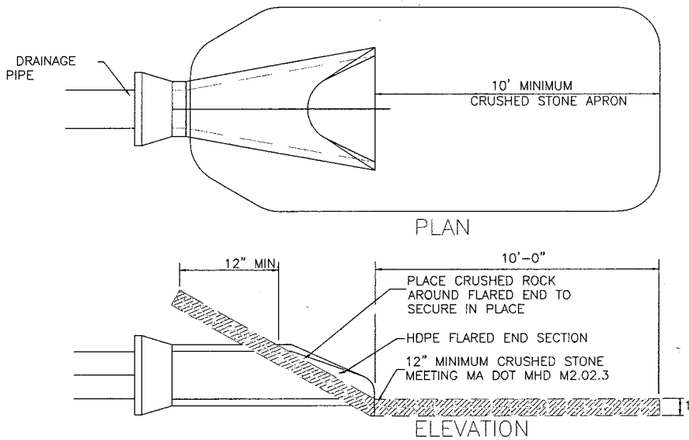

CROSS SECTION D-D
PROFILE OF SPILLWAY

NOT TO SCALE



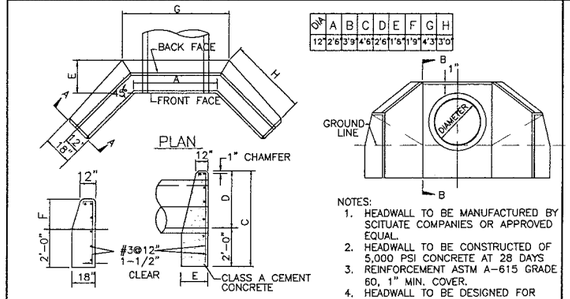

SIDEWALK THROUGH DRIVEWAYS WITHOUT CURB RETURNS

NOT TO SCALE




STONE APRON AT PIPE END

NOT TO SCALE



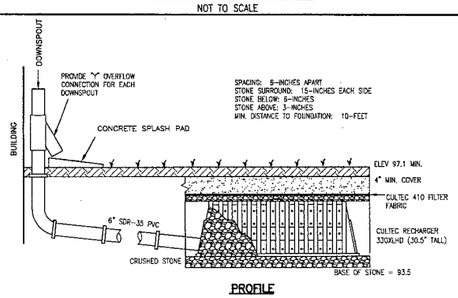

| DIA. | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 12" | 2'6" | 3'9" | 4'6" | 2'6" | 1'5" | 1'9" | 4'3" | 3'0" |




NOTES:
1. HEADWALL TO BE MANUFACTURED BY SCITUATE COMPANIES OR APPROVED EQUAL.
2. HEADWALL TO BE CONSTRUCTED OF 5,000 PSI CONCRETE AT 28 DAYS
3. REINFORCEMENT ASTM A-615 GRADE 60, 1" MIN. COVER.
4. HEADWALL TO BE DESIGNED FOR H-20 LOADING
5. WINGWALL PER MHD SPEC 206.6.0

CONCRETE HEADWALL

NOT TO SCALE




PROFILE

DETAIL OF ROOF RUNOFF INFILTRATION SYSTEM

NOT TO SCALE

NOTE:
TWO CULTEC UNITS SHALL BE INSTALLED AT EACH PROPOSED DWELLING. FINAL DESIGN SUBMITTED WITH INDIVIDUAL LOT DESIGN

RECOMMENDED MAINTENANCE PROCEDURE:

OIL IS REMOVED THROUGH THE 6" INSPECTION/OIL PORT AND SEDIMENT IS REMOVED THROUGH THE 24" DIAMETER OUTLET RISER PIPE. ALTERNATIVELY, OIL COULD BE REMOVED FROM THE 24" OPENING IF WATER IS REMOVED FROM TREATMENT CHAMBER, LOWERING THE OIL LEVEL BELOW THE DROP PIPES.

THE DEPTH OF SEDIMENT CAN BE MEASURED FROM THE SURFACE OF THE STORMCEPTOR WITH A DIPSTICK TUBE EQUIPPED WITH A BALL VALVE (SLUDGE JUDGE). RINKER MATERIALS RECOMMENDS MAINTENANCE BE PERFORMED ONCE THE SEDIMENT DEPTH EXCEEDS THE GUIDELINE VALUE PROVIDED IN TABLE BELOW.

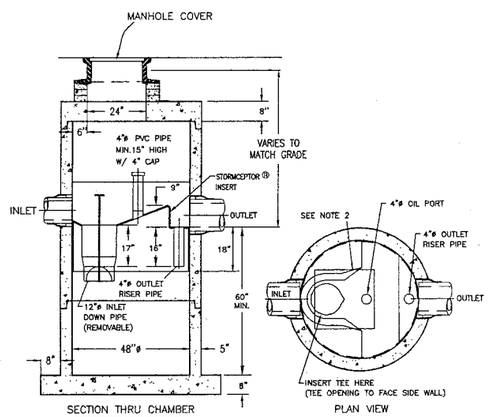
| TABLE SEDIMENT DEPTHS INDICATING REQUIRED MAINTANCE* | |
|---|---|
| MODEL | SEDIMENT DEPTH |
| 450i | 8" (200MM) |
| 900 | 8" (200MM) |
| 1200 | 10" (250MM) |
| 1800 | 15" (375MM) |
| 2400 | 12" (300MM) |
| 3600 | 17" (425MM) |
| 4800 | 15" (375MM) |
| 6000 | 18" (450MM) |
| 7200 | 15" (375MM) |
| 11000s | 17" (425MM)** |
| 13000s | 20" (500MM)** |
| 16000s | 17" (425MM)** |

* DEPTHS ARE APPROXIMATE

** DEPTHS IN EACH STRUCTURE

NO ENTRY INTO THE UNIT IS REQUIRED FOR ROUTINE MAINTENANCE OF THE INLET STORMCEPTORROR THE SMALLER DISC INSERT MODELS OF THE IN-LINE STORMCEPTOR. ENTRY TO THE LEVEL OF THE BY-PASS MAY BE REQUIRED FOR SERVICING THE LARGER IN-LINE MODELS. ANY POTENTIAL OBSTRUCTIONS AT THE INLET CAN BE OBSERVED FROM THE SURFACE. THE BY-PASS CHAMBER HAS BEEN DESIGNATED AS A PLATFORM FOR AUTHORIZED MAINTENANCE PERSONNEL, IN THE EVENT THAT AN OBSTRUCTION NEEDS TO BE REMOVED, DRAIN FLUSHING NEEDS TO BE PERFORMED, OR CAMERA SURVEYS ARE REQUIRED.

TYPICALLY, MAINTENANCE IS PERFORMED BY THE VACUUM SERVICE INDUSTRY, A WELL ESTABLISHED SECTOR OF THE SERVICE INDUSTRY THAT CLEANS UNDERGROUND TANKS, SEWERS, AND CATCH-BASINS. COSTS TO CLEAN THE STORMCEPTOR WILL VARY BASED ON THE SIZE OF THE UNIT AND TRANSPORTATION DISTANCES. IF YOU NEED ASSISTANCE FOR CLEANING A STORMCEPTOR UNIT, CONTACT YOUR LOCAL RINKER MATERIALS REPRESENTATIVE, OR THE RINKER MATERIALS STORMCEPTOR INFORMATION LINE AT (800) 909-7763.




NOT TO SCALE

NOTES:
1. THE USE OF FLEXIBLE CONNECTION IS RECOMMENDED AT THE INLET AND OUTLET WHERE APPLICABLE.
2. THE COVER SHOULD BE POSITIONED OVER THE INLET DROP PIPE AND THE OIL PORT.
3. THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: #4985148, #5498331, #5725760, #5753115, #5849181, #6068765, #6371690.
4. CONTACT A CONCRETE PIPE DIVISION REPRESENTATIVE FOR FURTHER DETAILS NOT LISTED ON THIS DRAWING.

**NEW BEDFORD PLANNING BOARD**

APPROVED UNDER THE SUBDIVISION CONTROL LAW REQUIRED

DATE:

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|---|---|---|---|---|
| 5 | 2/3/14 | REVISED ROAD LAYOUT | EKW | RJR |
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| 2 | 11/13/13 | RESPONSE TO DPI COMMENTS | EKW | RJR |
| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: **DETAIL SHEET**

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS

- CIVIL ENGINEERING
- LAND SURVEYING
- ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING INC

P.O. BOX 1088
350 BEDFORD ST.
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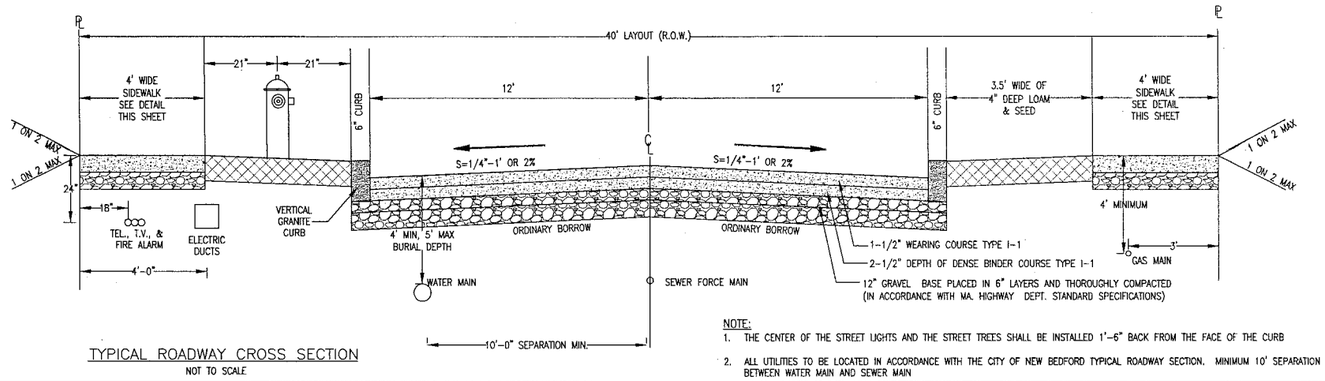
| | |
|---|---|
| SCALE: | AS NOTED |
| DATE: | APRIL 22, 2013 |
| DRAWN BY: | JLB/RMF |
| DESIGNED BY: | JLB/RMF |
| CHECKED BY: | RJR |
| APPROVED BY: | RJR |
| SHEET NO.: | DE1 |
| PROJECT NO. | 1931-0101 |

COMMONWEALTH OF MASSACHUSETTS — RICHARD J. RHEAUME — No. 32173 — REGISTERED PROFESSIONAL ENGINEER

O:\PROJECTS\New Bedford\Swallow Street\Map 136-2 Lot 353 Swallow Street\ENGINEERING\Definitive\BASE.dwg

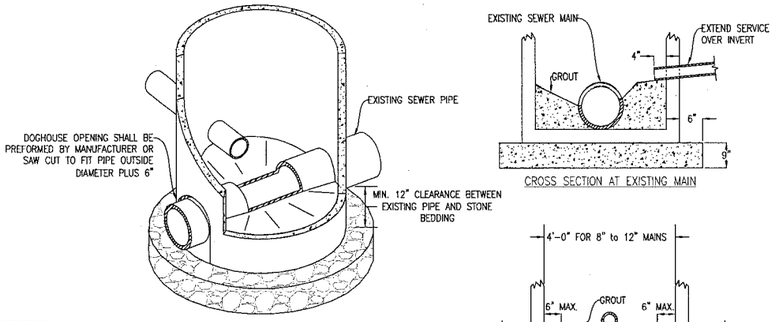



TYPICAL ROADWAY CROSS SECTION

NOT TO SCALE

NOTE:

1. THE CENTER OF THE STREET LIGHTS AND THE STREET TREES SHALL BE INSTALLED 1'-6" BACK FROM THE FACE OF THE CURB
2. ALL UTILITIES TO BE LOCATED IN ACCORDANCE WITH THE CITY OF NEW BEDFORD TYPICAL ROADWAY SECTION. MINIMUM 10' SEPARATION BETWEEN WATER MAIN AND SEWER MAIN

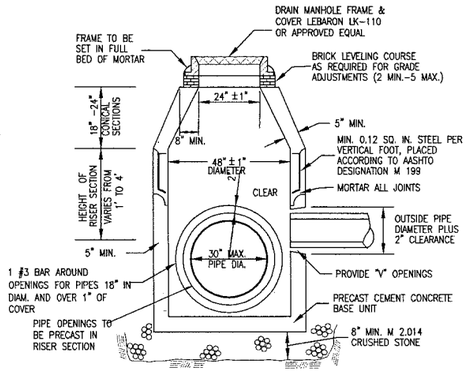



NOTES:

1. FLOW SHALL BE MAINTAINED DURING CONSTRUCTION.
2. MANHOLE PAD TO REST UPON A MINIMUM 6" COMPACTED #67 STONE BASE.
3. A WATER TIGHT SEAL MUST BE CONSTRUCTED BETWEEN THE MANHOLE, THE BASE AND THE MANHOLE SECTIONS AROUND THE PIPES.

DOGHOUSE MANHOLE INSTALLATION OVER EXISTING SEWER MAIN

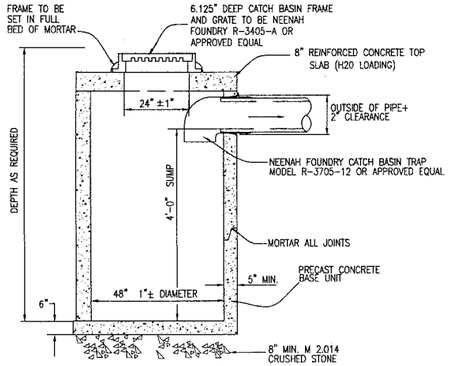
NOT TO SCALE




PRECAST CONCRETE DRAIN MANHOLE

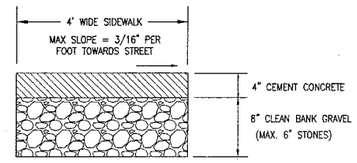
NOT TO SCALE

NOTE: AN H-20 RATED PRE-CAST FLAT TOP SHALL BE USED ON ALL DRAINAGE STRUCTURES WITH LESS THAN 3' OF COVER TO FINISH GRADE.



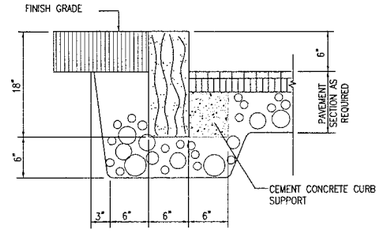

TYPICAL FLAT TOP CATCH BASIN

NOT TO SCALE



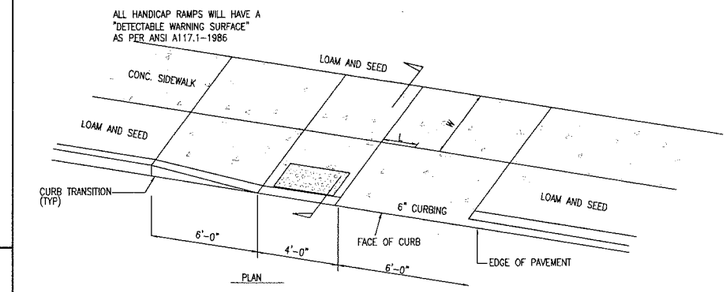

CONCRETE SIDEWALK

NOT TO SCALE




VERTICAL GRANITE CURB

NOT TO SCALE

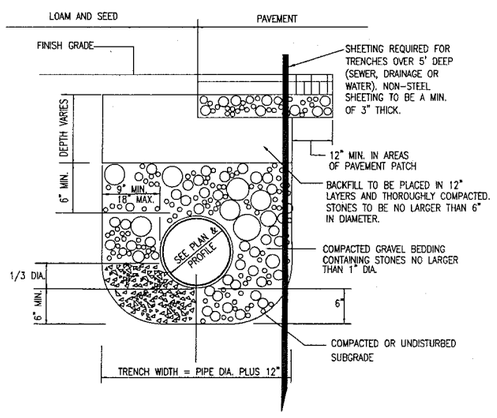



| W | L |
|---|---|
| 4'-0" | 3'-6"± |
| 5'-0" | 2'-9"± |
| 6'-0" | 2'-0"± |
| 7'-0" | 1'-3"± |
| 8'-0" | 0'-0" |

1. THE DIMENSIONS SHOWN AT ROADWAY EDGE ARE FIXED DISTANCES.
2. RAMP CROSS SECTION TO BE THE SAME AS ADJACENT SIDEWALK.
3. CEMENT CONCRETE RAMPS ARE TO BE TEXTURED BY BROOMING IN A DIRECTION PARALLEL TO THE LENGTH OF THE RAMP.
4. IN NO CASE ARE THE RAMPS TO BE PLACED BEHIND THE STOP SIGN.
5. SIDEWALKS THAT CROSS DRIVEWAYS SHALL BE RAMPED TO MEET THE GRADE OF THE DRIVEWAY.
6. THESE DIMENSIONS ARE SUBJECT TO CHANGE IN THE FIELD IF EXISTING CONDITIONS WILL MAKE THE RAMP LOCATIONS IMPRACTICAL OR UNSAFE.

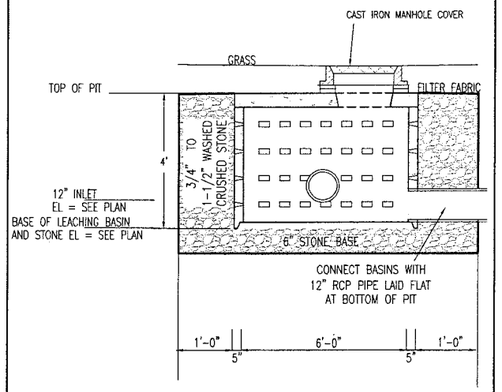
WHEELCHAIR RAMP DETAIL

NOT TO SCALE



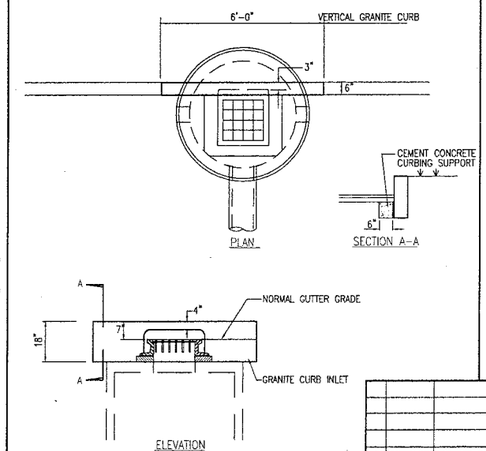

PIPE TRENCH DETAIL

NOT TO SCALE




LEACHING PIT DETAIL

NOT TO SCALE




GRANITE CURB INLET

NOT TO SCALE

**NEW BEDFORD PLANNING BOARD**

APPROVED UNDER THE SUBDIVISION CONTROL LAW REQUIRED

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| 2 | 11/13/13 | RESPONSE TO DPI COMMENTS | EKW | RJR |
| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: **DETAIL SHEET**

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS


• CIVIL ENGINEERING
• LAND SURVEYING
• ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING INC

P.O. BOX 1088
350 BEDFORD ST.
LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004


| | |
|---|---|
| SCALE: | AS NOTED |
| DATE: | APRIL. 22, 2013 |
| DRAWN BY: | JLB/RMF |
| DESIGNED BY: | JLB/RMF |
| CHECKED BY: | RJR |
| APPROVED BY: | RJR |
| SHEET NO.: | DE2 |
| PROJECT NO. | 1931-0101 |

COMMONWEALTH OF MASSACHUSETTS — RICHARD P. PINCHIME No. 26373 CIVIL — REGISTERED PROFESSIONAL ENGINEER

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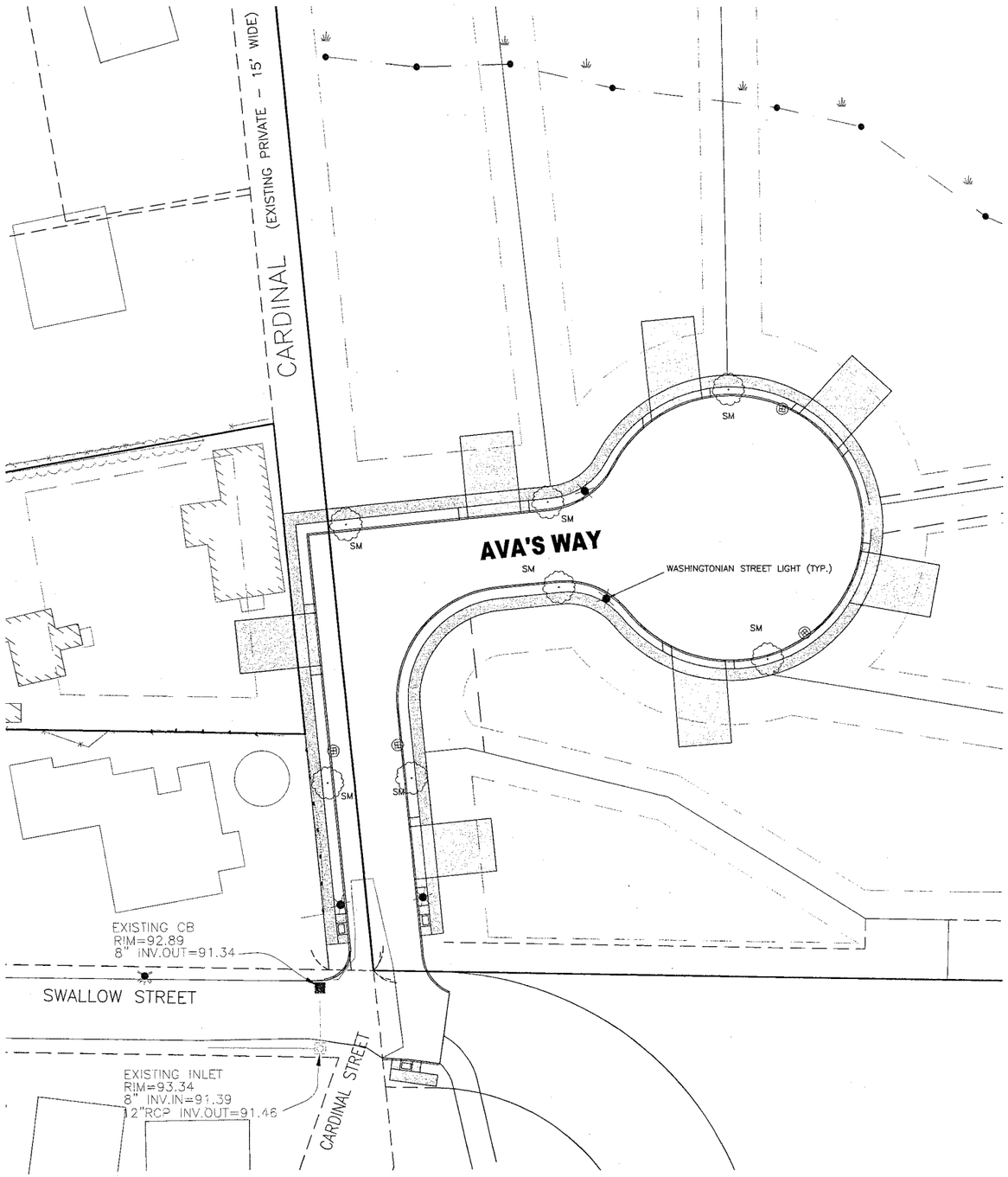
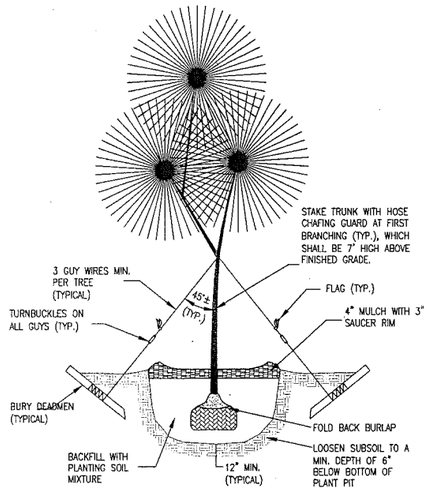
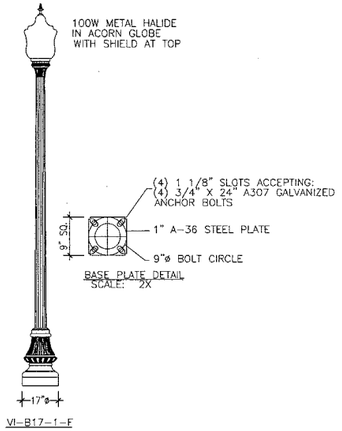



NOTE: ALL STREET TREES SHALL HAVE A MIN. 3" CALIPER AT A HEIGHT OF 12'.

STREET TREE PLANTING

NOT TO SCALE




BASE PLATE DETAIL
SCALE: 2X

VI-B17-1-F

12' HIGH WASHINGTONIAN LIGHT

NOT TO SCALE

NOTES:

1. ONE STREET TREE TO BE PROVIDED PER LOT AND SHALL BE PLANTED IN ACCORDANCE WITH ARTICLE VII, SECTION J OF THE CITY OF NEW BEDFORD REGULATIONS.
2. THE ACTUAL INTERVAL, FREQUENCY, CANDLEPOWER AND SIZE OF LIGHTING FIXTURE SHALL BE DETERMINED BY THE INSPECTOR OF WIRES OF THE CITY OF NEW BEDFORD AND SHALL BE INSTALLED IN ACCORDANCE WITH SUBDIVISION REGULATIONS, ARTICLE VII, SECTION H.
3. THE DEVELOPER OR GENERAL CONTRACTOR SHALL ALSO PROVIDE TO THE CITY A NUMBER OF LIGHT POLES AND FIXTURES EQUIVALENT TO TEN PERCENT OF THE TOTAL NUMBER INSTALLED AS PART OF THE SUBDIVISION, BUT IN NO CASE LESS THAN ONE LIGHT POLE AND ONE FIXTURE.

PLANT KEY

| SYMBOL | QUANTITY | SCIENTIFIC NAME | COMMON NAME | SIZE |
|---|---|---|---|---|
| | | | | |
| SM | 7 | ACER SACCHARUM | SUGAR MAPLE | 12' TALL 2" CALIPER |

**NEW BEDFORD PLANNING BOARD**

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| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: LANDSCAPE AND LIGHTING PLAN

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS


• CIVIL ENGINEERING
• LAND SURVEYING
• ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING INC.

P.O. BOX 1088
350 BEDFORD ST.
LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004


| | |
|---|---|
| SCALE: | 1" = 20' |
| DATE: | APRIL 22, 2013 |
| DRAWN BY: | JLB/RMF |
| DESIGNED BY: | JLB/RMF |
| CHECKED BY: | RJR |
| APPROVED BY: | RJR |
| SHEET NO. | LP1 |
| PROJECT NO. | 1931-0101 |

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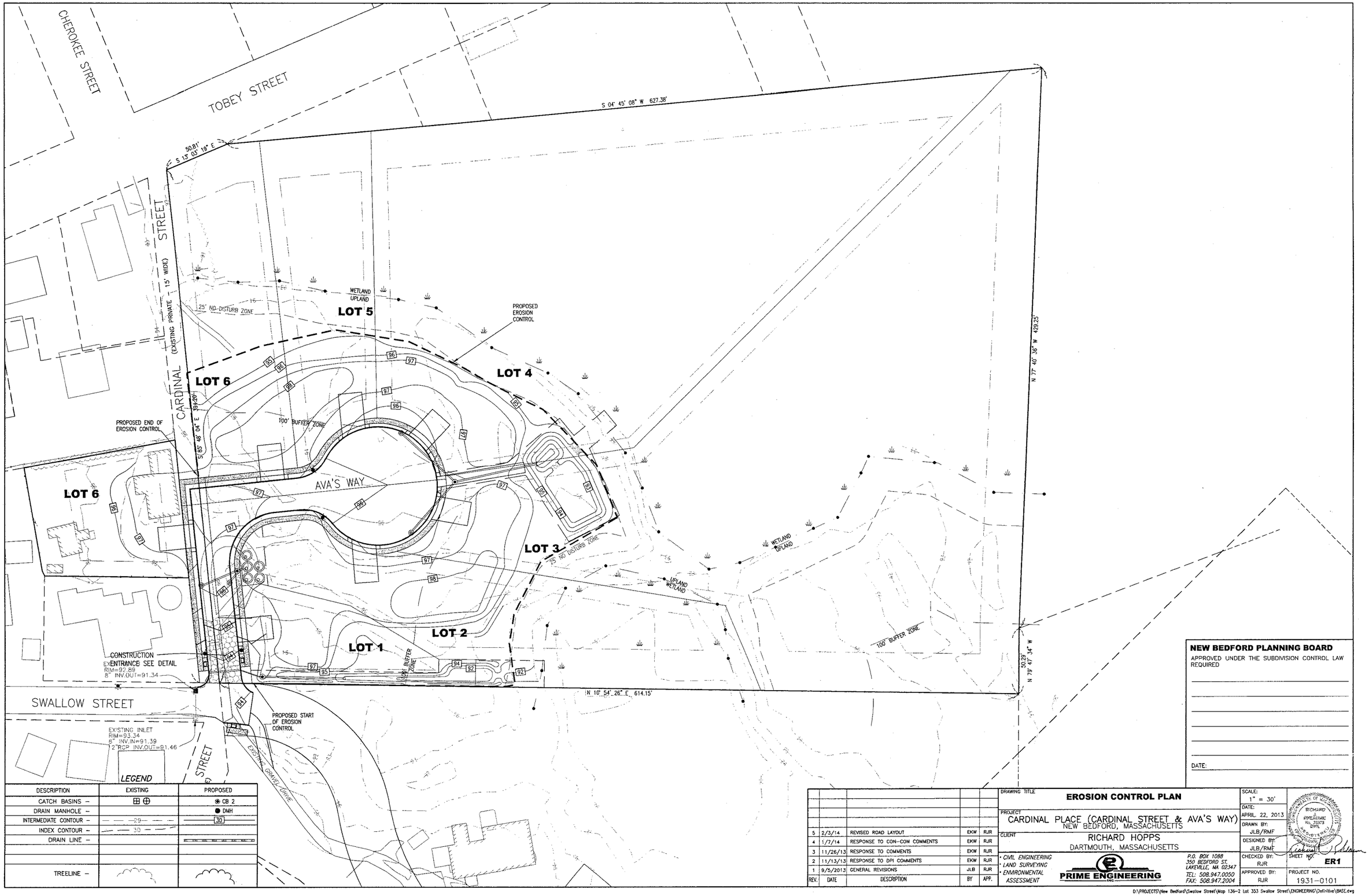


**NEW BEDFORD PLANNING BOARD**

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| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: **EROSION CONTROL PLAN**

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS

SCALE: 1" = 30'
DATE: APRIL 22, 2013
DRAWN BY: JLB/RMF
DESIGNED BY: JLB/RMF
CHECKED BY: RJR
APPROVED BY: RJR
SHEET NO: ER1
PROJECT NO. 1931-0101


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RICHARD MARSHALL HOPPS No. 23373 REGISTERED PROFESSIONAL ENGINEER

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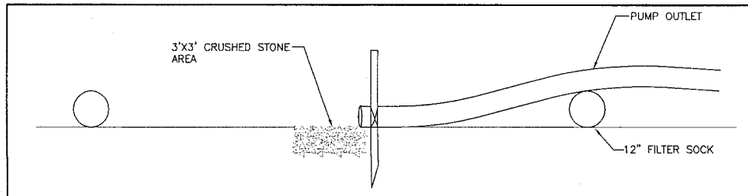
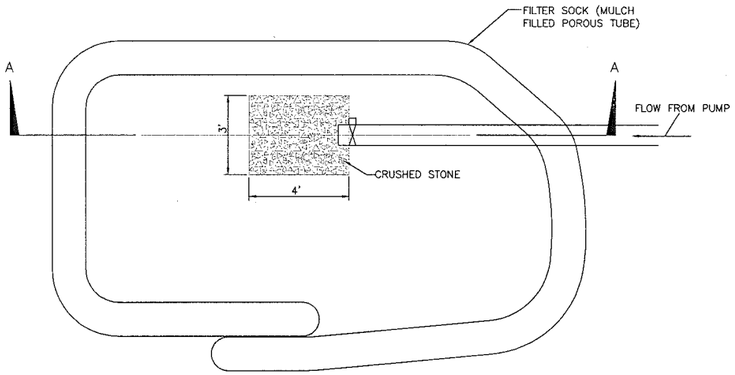



SECTION A–A




NOTE:
1.) SIZE OF BASIN TO BE DETERMINED BY LENGTH AND RATE OF DEWATERING OPERATION.

2.) AS AN ALTERNATIVE TO FILTER SOCK, WOOD MULCH STRANDS (NOT CHIPS) MAY BE PLACED IN A 3 FOOT HIGH WINDROW.

PLAN

## DEWATERING BASIN PLAN

NOT TO SCALE

## CONSTRUCTION OPERATION AND MAINTENANCE SCHEDULE

THE OPERATION AND MAINTENANCE (O&M) SCHEDULE DURING THE CONSTRUCTION PHASE IS THE RESPONSIBILITY OF THE DEVELOPER AND/OR SITE CONTRACTOR. THE OUTLINE BELOW SHALL BE ADHERED TO AS CLOSELY AS POSSIBLE TO ENSURE THE PROPER CONSTRUCTION AND FUNCTION OF THE DRAINAGE SYSTEM.

1. PRIOR TO CONSTRUCTION, HAYBALES AND SILT FENCE SHALL BE INSTALLED PER THE APPROVED PLANS. THE HAY BALES AND SILT FENCE SHALL BE INSPECTED PRIOR TO A LARGE STORM EVENT TO ENSURE THAT THE EROSION CONTROL WILL FUNCTION AS REQUIRD AND FOLLOWING A STORM TO INSPECT FOR DAMAGE TO THE EROSION CONTROL ELEMENTS. ANY DAMAGE OR IMPROPER INSTALLATION THAT IS NOTICED PRIOR TO OR FOLLOWING A STORM EVENT SHALL BE PROMPTLY REPLACED OR REPAIRED IN A SATISFACTORY MANNER SO AS TO PREVENT SEDIMENT FROM BYPASSING THE EROSION CONTROL BARRIER.

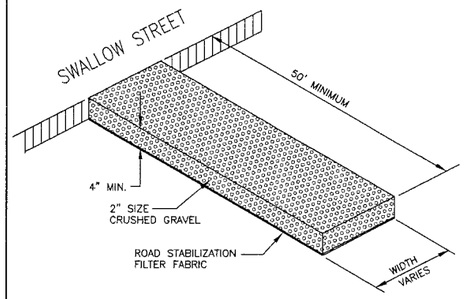
2. THE LIMIT OF CLEARING SHOWN ON THE APPROVED PLAN SHALL BE STRICTLY ADHERED TO. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE LEVEL OF SAFETY OF STANDING TREES.

3. IN CONJUNCTION WITH THE ROADWAY CONSTRUCTION, ALL DRAINAGE STRUCTURES, INCLUDING THE RETENTION BASIN, SHALL BE CONSTRUCTED AND STABILIZED AS SOON AS POSSIBLE. METHODS OF STABILIZATION INCLUDE, BUT ARE NOT LIMITED TO, HYDROSEED, LOAM AND SEED, STRAW MULCH, EROSION CONTROL BLANKETS, ETC.

4. THE CATCH BASINS AND SEDIMENT FOREBAYS SHALL BE INSPECTED WEEKLY DURING CONSTRUCTION. ANY SEDIMENT BUILDUP OF EIGHT (8) INCH DEPTH IN EITHER OF THE STRUCTURES SHALL BE PROMPTLY REMOVED BY HAND OR MECHANICAL METHODS AND ALL DEBRIS REMOVED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

5. THE RETENTION BASIN AND FOREBAYS SHALL BE INSPECTED WEEKLY OR AFTER ALL RAINFALL EVENTS GREATER THAN 1/2 INCH, WHICHEVER OCCURS SOONER. ANY EROSION WITHIN THE BASIN OR FOREBAYS SHALL BE FILLED AND RESTABILIZED IN A MANNER TO PREVENT FUTURE EROSION. IN ADDITION, THE OUTER PORTIONS OF THE RETENTION BASINS SHALL BE INSPECTED IN A SIMILAR MANNER.

6. THIS SCHEDULE MUST BE ADHERED TO BY THE OWNER AND/OR CONTRACTOR UNTIL THE ROADWAY IS ACCEPTED BY THE TOWN.




## ANTI–TRACKING PAD

NOT TO SCALE

## EROSION & SEDIMENT CONTROL NOTES:

IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTROL EROSION AND PREVENT SEDIMENTATION WITHIN THE 25' NO DISTURB ZONE OR OFFSITE PROPERTIES. IT IS INTENDED THAT THE IMPLEMENTATION OF THE FOLLOWING MEASURES WILL MEET THIS GOAL. WHEN IT IS CLEAR TO THE DESIGNER THAT EROSION AND SEDIMENTATION HAVE BEEN ADEQUATELY CONTROLLED WITHOUT THE IMPLEMENTATION OF EVERY MEASURE, ADDITIONAL MEASURES NEED NOT BE IMPLEMENTED. ALTERNATIVELY, IF ALL OF THE FOLLOWING MEASURES HAVE BEEN IMPLEMENTED AND THE CONTROL OF EROSION AND SEDIMENTATION IS INADEQUATE, THE CONTRACTOR MUST EMPLOY SUFFICIENT SUPPLEMENTAL MEASURES BEYOND THE SCOPE OF THIS PLAN.

1. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED PRIOR TO STUMP REMOVAL AND CONSTRUCTION. STABILIZATION OF ALL REGRADED AND SOIL STOCKPILE AREAS WILL BE INITIATED AND MAINTAINED DURING ALL PHASES OF CONSTRUCTION.

2. ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CONSTRUCTED IN ACCORDANCE WITH LOCAL MUNICIPAL REGULATIONS. ALL EROSION CONTROL MEASURES ARE TO BE MAINTAINED AND UPGRADED AS REQUIRED TO ACHIEVE PROPER SEDIMENT CONTROL DURING CONSTRUCTION. A STAKED HAYBALE DAM SHALL BE INSTALLED DOWN GRADIENT OF ALL DRAINAGE OUTFALLS.

3. ADDITIONAL CONTROL MEASURES WILL BE INSTALLED DURING THE CONSTRUCTION PERIOD, IF DEEMED NECESSARY BY THE OWNER OR AGENTS OF THE OWNER.

4. CATCH BASINS WILL BE PROTECTED WITH HAYBALE FILTERS THROUGHOUT THE CONSTRUCTION PERIOD UNTIL ALL DISTURBED AREAS ARE THOROUGHLY STABILIZED. SILT SOCKS SHOULD BE INSTALLED UNDER GRATE OPENING UNTIL PAVEMENT IS IN PLACE AND GROUND SURFACE IS STABILIZED.

5. SEEDING MIXTURE FOR FINISHED GRASSED AREAS WILL BE AS FOLLOWS:

| | |
|---|---|
| KENTUCKY BLUE GRASS | 45% |
| CREEPING RED FESCUE | 45% |
| PERENNIAL RYEGRASS | 10% |

SEED TO BE APPLIED AT A RATE OF 4 LBS./1000 SQ. FT.
PLANTING SEASONS SHALL BE APRIL 1 TO JUNE 1 AND AUGUST 1 TO OCTOBER 15. AFTER OCTOBER 15, AREAS WILL BE STABILIZED WITH HAYBALE CHECK, FILTER FABRIC, OR WOODCHIP MULCH, AS REQUIRED, TO CONTROL EROSION.

6. AREAS THAT ARE NOT THE LOCATION OF ACTIVE CONSTRUCTION WHICH ARE TO BE LEFT BARE FOR OVER ONE MONTH BEFORE FINISHED GRADING AND SEEDING IS ACHIEVED, SHALL BE MULCHED OR RECEIVE TEMPORARY STABILIZATION SUCH AS JUTE NETTING OR SHALL RECEIVE A TEMPORARY SEEDING OF PERENNIAL RYEGRASS APPLIED TO A RATE OF 2 LBS./1,000 SQ. FT. LIMESTONE (EQUIVALENT TO BE 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE) SHALL BE APPLIED AS SEEDBED PREPARATION AT A RATE OF 90 LBS./1,000 SQ. FT. PLANTING SEASONS SHALL BE APRIL 1 TO JUNE 1 AND AUGUST 1 TO OCTOBER 1. AREAS TO BE LEFT BARE BEFORE FINISH GRADING AND SEEDING OUTSIDE OF PLANTING SEASONS SHALL RECEIVE AN AIR–DRIED WOOD CHIP MULCH, FREE OF COARSE MATTER.

7. AT ALL PROPOSED FILL AREAS WHICH ARE NOT CURRENTLY SHOWN ON THESE PLANS, THE CONTRACTOR SHALL ESTABLISH AN EROSION CONTROL LINE (HAYBALE CHECK OR FILTER FABRIC) ABOUT TEN (10') FEET FROM TOE TO SLOPE OF PROPOSED FILL AREAS PRIOR TO BEGINNING FILL INSTALLATION. STABILIZATION OF SLOPES IN FILL AREAS (USING MULCH OR GRASS) SHALL BE INITIATED WITHIN THIRTY (30) DAYS OF COMMENCEMENT OF FILL INSTALLATION.

8. STABILIZATION OF SLOPES IN CUT AREAS (USING MULCH OR GRASS) AND THE INSTALLATION OF CONTROL LINE (HAYBALE CHECK OR FILTER FABRIC) AT THE TOE OF SLOPE SHALL BE INITIATED WITHIN THIRTY (30) DAYS OF COMPLETION.

9. SEDIMENT REMOVED FROM CONTROL STRUCTURES WILL BE DISPOSED IN A MANNER WHICH IS CONSISTENT WITH THE INTENT OF THE PLAN. ALL HAYBALES OR SILT FENCE RETAINING SEDIMENT OVER 1/2 THEIR HEIGHT SHALL HAVE THE SEDIMENT REMOVED AND ALL DAMAGED EROSION CONTROLS SHALL BE REPAIRED OR REPLACED.

10. CONTRACTOR WILL BE ASSIGNED THE RESPONSIBILITY FOR IMPLEMENTING THIS EROSION AND SEDIMENT CONTROL PLAN. THIS RESPONSIBILITY INCLUDES THE INSTALLATION AND MAINTENANCE OF CONTROL MEASURES, INFORMING ALL PARTIES ENGAGED ON THE CONSTRUCTION SITE OF THE REQUIREMENTS AND OBJECTIVES OF THE PLAN, AND NOTIFYING THE ROCHESTER PLANNING BOARD OF ANY TRANSFER OF THIS RESPONSIBILITY. THE OWNER SHALL BE RESPONSIBLE FOR CONVEYING A COPY OF THE EROSION AND SEDIMENT CONTROL PLAN IF THE TITLE TO THE LAND IS TRANSFERRED.

11. THE CONTRACTOR SHALL SECURE THE SERVICES OF A PROFESSIONAL ENGINEER, WHO SHALL VERIFY IN THE FIELD THAT THE CONTROLS REQUIRED BY THIS PLAN ARE PROPERLY INSTALLED, SHALL MAKE INSPECTION OF SUCH FACILITIES NOT LESS FREQUENTLY THAN EVERY 14 DAYS OR AFTER A RAINFALL IN EXCESS OF 1/2 INCH, WHICHEVER OCCURS FIRST. THE INSPECTION REPORTS SHALL BE SUBMITTED TO THE PLANNING DEPARTMENT AND CONSERVATION COMMISSION OFFICE ON A MONTHLY BASIS.

12. STOCKPILES OF SOIL SHALL BE SURROUNDED BY A SEDIMENT BARRIER. SOIL STOCKPILES TO BE LEFT BARE FOR MORE THAN THIRTY (30) DAYS SHALL BE STABILIZED WITH TEMPORARY VEGETATION OR MULCH. IF SOIL STOCKPILES ARE TO REMAIN FOR MORE THAN SIXTY (60) DAYS, FILTER FABRIC SHALL BE USED IN PLACE OF HAYBALES. SIDE SLOPES SHALL NOT EXCEED 2:1.

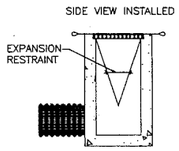
13. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTROL DUST AND WIND EROSION THROUGHOUT THE LIFE OF HIS CONTRACT. DUST CONTROL SHALL INCLUDE, BUT IS NOT LIMITED TO SPRINKLING OF WATER ON EXPOSED SOILS AND HAUL ROADS. CONTRACTOR SHALL CONTROL DUST TO PREVENT A HAZARD TO TRAFFIC.

14. IF FINAL GRADING IS TO BE DELAYED FOR MORE THAN THIRTY (30) DAYS AFTER LAND DISTURBANCES CEASE, TEMPORARY VEGETATION OR MULCH SHALL BE USED TO STABILIZE SOILS.

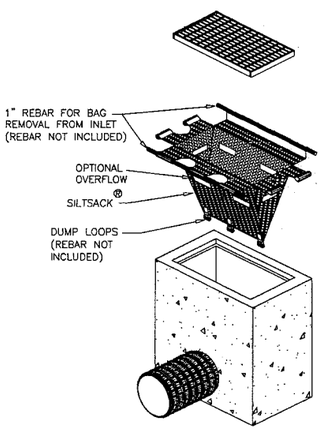
15. HAYBALES SHALL BE USED ONLY AS A TEMPORARY MEASURE. WHERE CONTROL MEASURES WILL BE REQUIRED FOR LONGER THAN SIXTY (60) DAYS, FILTER FABRIC SHALL BE USED.

16. WHERE DEWATERING IS NECESSARY, THERE SHALL NOT BE A DISCHARGE DIRECTLY INTO WETLANDS OR WATERCOURSES. PROPER METHODS AND DEVICES SHALL BE UTILIZED TO THE EXTENT PERMITTED BY LAW, SUCH AS PUMPING WATER INTO A TEMPORARY SEDIMENTATION BOWL, PROVIDING SURGE PROTECTION AT THE INLET AND THE OUTLET OF PUMPS, OR FLOATING THE INTAKE OF THE PUMP, OR OTHER METHODS TO MINIMIZE AND RETAIN THE SUSPENDED SOLIDS. IF A PUMPING OPERATION IS CAUSING TURBIDITY PROBLEMS, SAID OPERATION SHALL CEASE UNTIL SUCH TIME AS FEASIBLE MEANS OF CONTROLLING TURBIDITY ARE DETERMINED AND IMPLEMENTED. SAID DISCHARGE POINTS SHALL BE LOCATED OVER 100 FEET FROM THE DELINEATED WETLANDS AS INDICATED ON THIS PLAN.

SIDE VIEW INSTALLED




INSTALLATION DETAIL




NOTE: THE SILTSACK® WILL BE MANUFACTURED FROM A WOVEN POLYPROPYLENE FABRIC THAT MEETS OR EXCEEDS THE FOLLOWING SPECIFICATIONS.

REGULAR FLOW SILTSACK®
(FOR AREAS OF LOW TO MODERATE PRECIPITATION AND RUN–OFF)

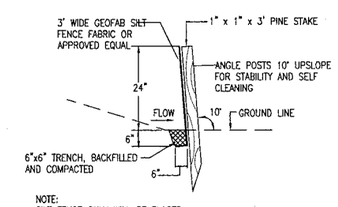
| PROPERTIES | TEST METHOD | UNITS |
|---|---|---|
| GRAB TENSILE | ASTM D–4632 | 300 LBS |
| STRENGTH GRAB | ASTM D–4632 | 20% |
| TENSILE ELONGATION | ASTM D–4833 | 120 LBS |
| PUNCTURE MULLEN | ASTM D–3786 | 800 PSI |
| BURST TRAPEZOID | ASTM D–4533 | 120 LBS |
| TEAR UV RESISTANCE | ASTM D–4355 | 80% |
| APPARENT OPENING | ASTM D–4751 | 40 US SIEVE |
| SIZE FLOW RATE | ASTM D–4491 | 40 GAL/MIN/SQ FT 0.55 |
| PERMITTIVITY | ASTM D–4491 | SEC –1 |

HI–FLOW SILTSACK®
(FOR AREAS OF MODERATE TO HEAVY PRECIPITATION AND RUN–OFF)

| PROPERTIES | TEST METHOD | UNITS |
|---|---|---|
| GRAB TENSILE | ASTM D–4632 | 265 LBS |
| STRENGTH GRAB | ASTM D–4632 | 20% |
| TENSILE ELONGATION | ASTM D–4833 | 135 LBS |
| PUNCTURE MULLEN | ASTM D–3786 | 420 PSI |
| BURST TRAPEZOID | ASTM D–4533 | 45 LBS |
| TEAR UV RESISTANCE | ASTM D–4355 | 90% |
| APPARENT OPENING | ASTM D–4751 | 20 US SIEVE |
| SIZE FLOW RATE | ASTM D–4491 | 200 GAL/MIN/SQ FT 1.5 |
| PERMITTIVITY | ASTM D–4491 | SEC –1 |

## DETAIL OF INLET SEDIMENT CONTROL DEVICE WITH CURB DEFLECTOR ("SILT SACK")

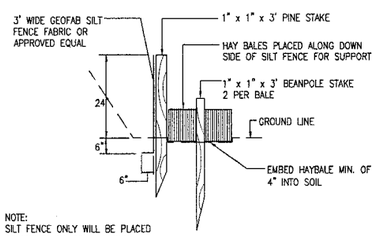
NOT TO SCALE




NOTE:
SILT FENCE ONLY WILL BE PLACED AS SHOWN ON THE "EROSION CONTROL PLAN".

## SILT FENCE DETAIL

NOT TO SCALE




NOTE:
SILT FENCE ONLY WILL BE PLACED AS SHOWN ON THE "EROSION CONTROL PLAN".

## HAY BALE AND SILT FENCE DETAIL

NOT TO SCALE

**NEW BEDFORD PLANNING BOARD**

APPROVED UNDER THE SUBDIVISION CONTROL LAW REQUIRED

DATE:

| REV. | DATE | DESCRIPTION | BY | APP. |
|---|---|---|---|---|
| 5 | 2/3/14 | REVISED ROAD LAYOUT | EKW | RJR |
| 4 | 1/7/14 | RESPONSE TO CON–COM COMMENTS | EKW | RJR |
| 3 | 11/26/13 | RESPONSE TO COMMENTS | EKW | RJR |
| 2 | 11/13/13 | RESPONSE TO DPI COMMENTS | EKW | RJR |
| 1 | 9/5/2013 | GENERAL REVISIONS | JLB | RJR |

DRAWING TITLE: **EROSION CONTROL DETAIL SHEET**

PROJECT: CARDINAL PLACE (CARDINAL STREET & AVA'S WAY)
NEW BEDFORD, MASSACHUSETTS

CLIENT: RICHARD HOPPS
DARTMOUTH, MASSACHUSETTS


• CIVIL ENGINEERING
• LAND SURVEYING
• ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING INC.

P.O. BOX 1088
350 BEDFORD ST.
LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004


| | |
|---|---|
| SCALE: | AS–NOTED |
| DATE: | APRIL 22, 2013 |
| DRAWN BY: | JLB/RWF |
| DESIGNED BY: | JLB/RWF |
| CHECKED BY: | RJR |
| APPROVED BY: | RJR |
| SHEET NO. | ER2 |
| PROJECT NO. | 1931–0101 |

RICHARD W. FARRELLY No. 52373 CIVIL

O:\PROJECTS\New Bedford\Swallow Street\Map 136–2 Lot 353 Swallow Street\ENGINEERING\Definitive\BASE.dwg

**APPENDIX A**

**DRAINAGE REPORT**

**Proposed**
**Cardinal Place**
**New Bedford, Massachusetts**

**Drainage Summary**

## 2 YR STORM (3.4 in.)

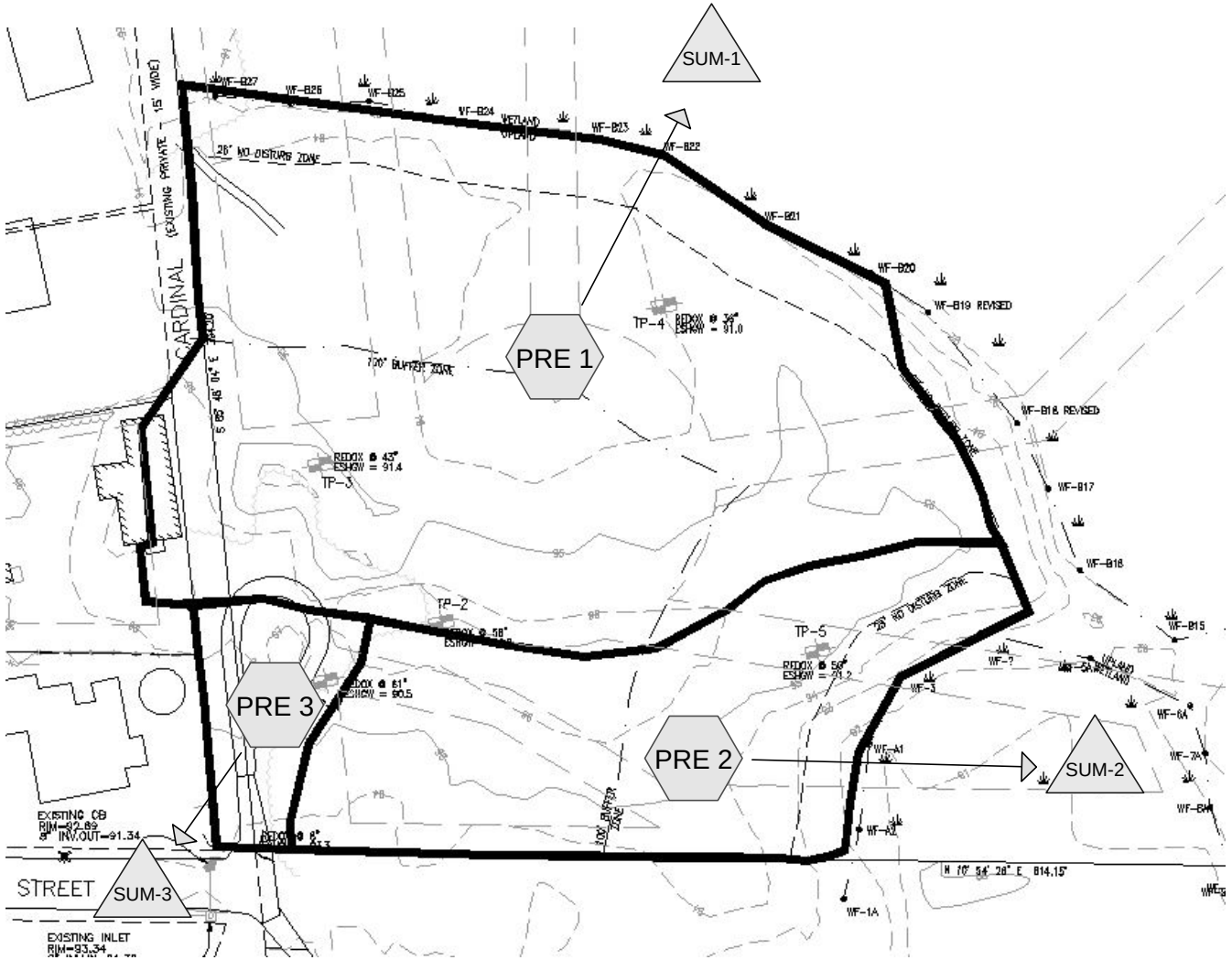
| Receptor | Pre Development Q Max (cfs) | Post Development Q Max (cfs) |
|---|---|---|
| East (Sum 1) | 0 | 0 |
| South (Sum 2) | 0 | 0 |
| Swallow St. (Sum 3) | 0.04 | 0 |

## 10 YR STORM (4.8 in.)

| Receptor | Pre Development Q Max (cfs) | Post Development Q Max (cfs) |
|---|---|---|
| East (Sum 1) | 0.01 | 0.01 |
| South (Sum 2) | 0.00 | 0.00 |
| Swallow St. (Sum 3) | 0.12 | 0.00 |

## 100 YR STORM (7.0 in.)

| Receptor | Pre Development Q Max (cfs) | Post Development Q Max (cfs) |
|---|---|---|
| East (Sum 1) | 0.29 | 0.13 |
| South (Sum 2) | 0.09 | 0.11 |
| Swallow St. (Sum 3) | 0.32 | 0.00 |




Subcat Reach Pond Link

**Drainage Diagram for PRE-DEVELOPMENT**

Prepared by Prime Engineering, Inc 2/4/2014

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment PRE 1:** Runoff Area=60,741 sf Runoff Depth=0.00"
Flow Length=203' Tc=16.0 min CN=36 Runoff=0.00 cfs 0.000 af

**Subcatchment PRE 2:** Runoff Area=18,680 sf Runoff Depth=0.00"
Flow Length=73' Tc=12.5 min CN=36 Runoff=0.00 cfs 0.000 af

**Subcatchment PRE 3:** Runoff Area=5,076 sf Runoff Depth=0.41"
Tc=6.0 min CN=58 Runoff=0.03 cfs 0.004 af

**Pond SUM-1:** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Pond SUM-2:** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Pond SUM-3:** Inflow=0.03 cfs 0.004 af
Primary=0.03 cfs 0.004 af

**Total Runoff Area = 1.940 ac Runoff Volume = 0.004 af Average Runoff Depth = 0.02"**

## Subcatchment PRE 1:

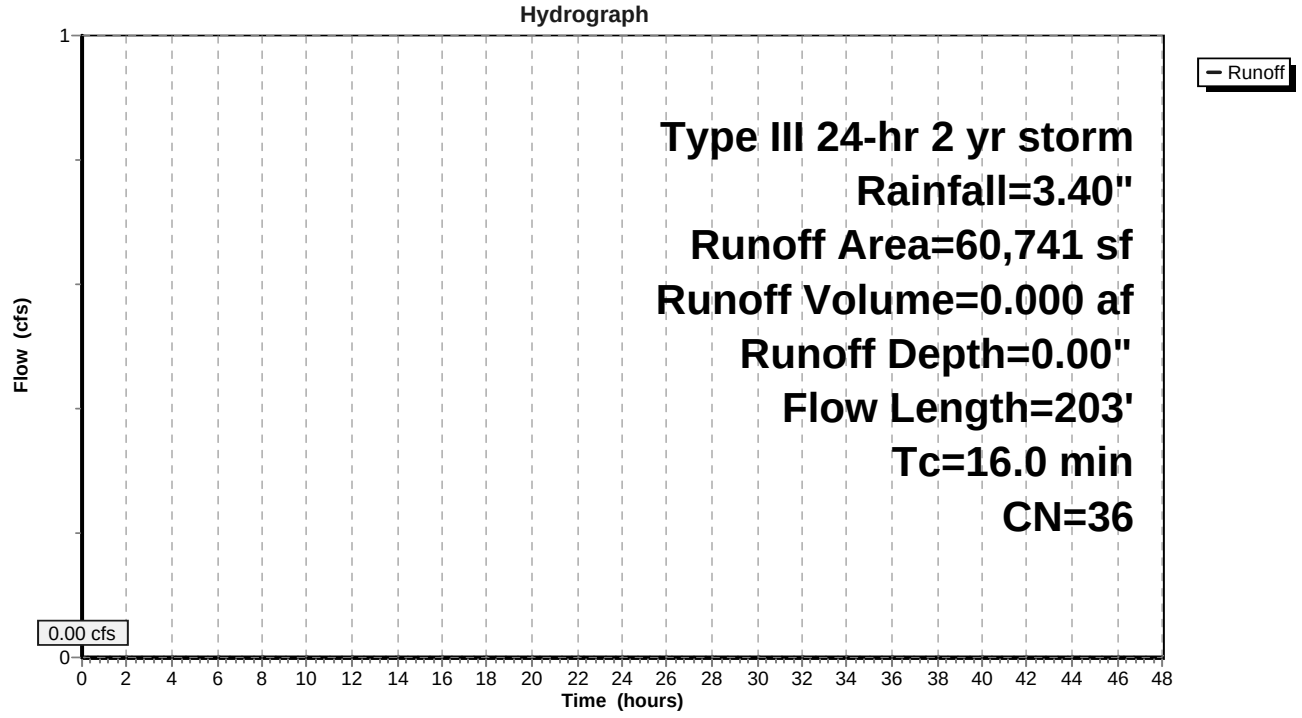
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 46,430 | 36 | Woods, Fair, HSG A |
| 2,868 | 49 | 50-75% Grass cover, Fair, HSG A |
| 246 | 76 | Gravel roads, HSG A |
| 545 | 98 | roof |
| 10,652 | 30 | Woods, Good, HSG A |
| 60,741 | 36 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.0 | 50 | 0.0200 | 0.1 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40" |
| 4.0 | 153 | 0.0163 | 0.6 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.0 | 203 | Total | | | |

## Subcatchment PRE 1:



## Subcatchment PRE 2:

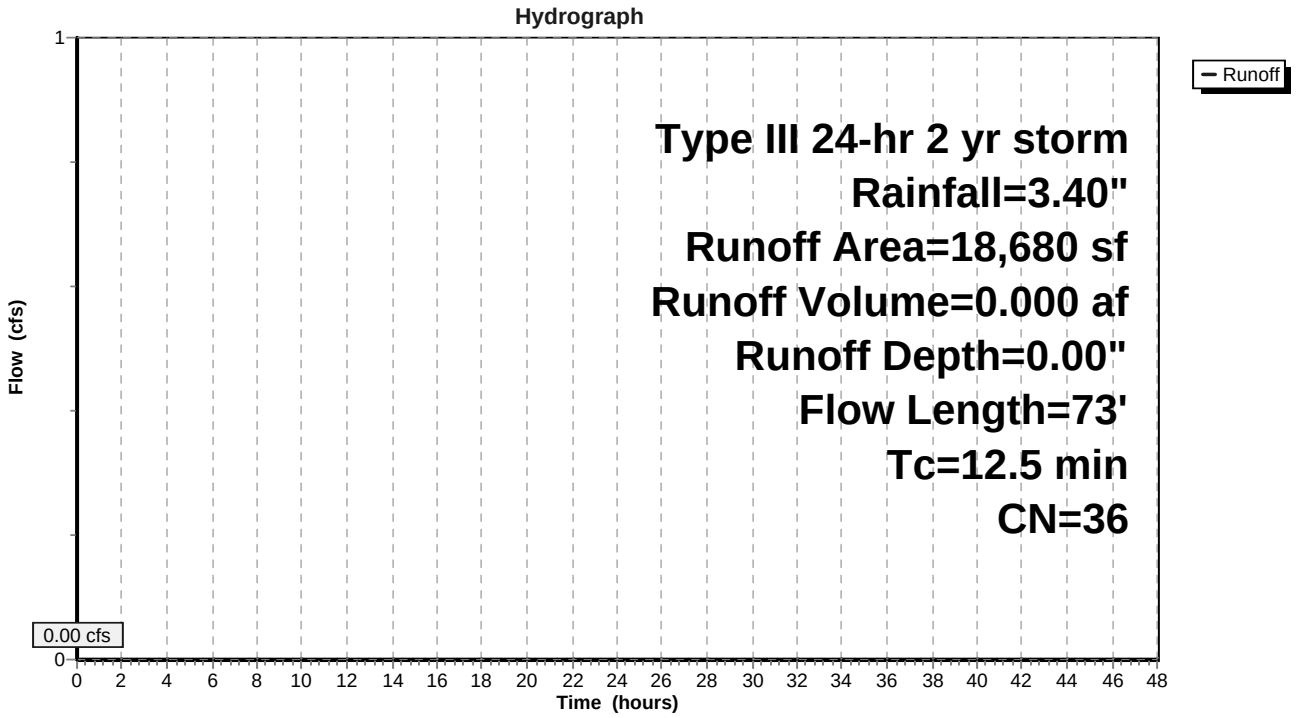
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 18,680 | 36 | Woods, Fair, HSG A |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.0 | 50 | 0.0200 | 0.1 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40" |
| 0.5 | 23 | 0.0200 | 0.7 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.5 | 73 | Total | | | |

## Subcatchment PRE 2:



## Subcatchment PRE 3:

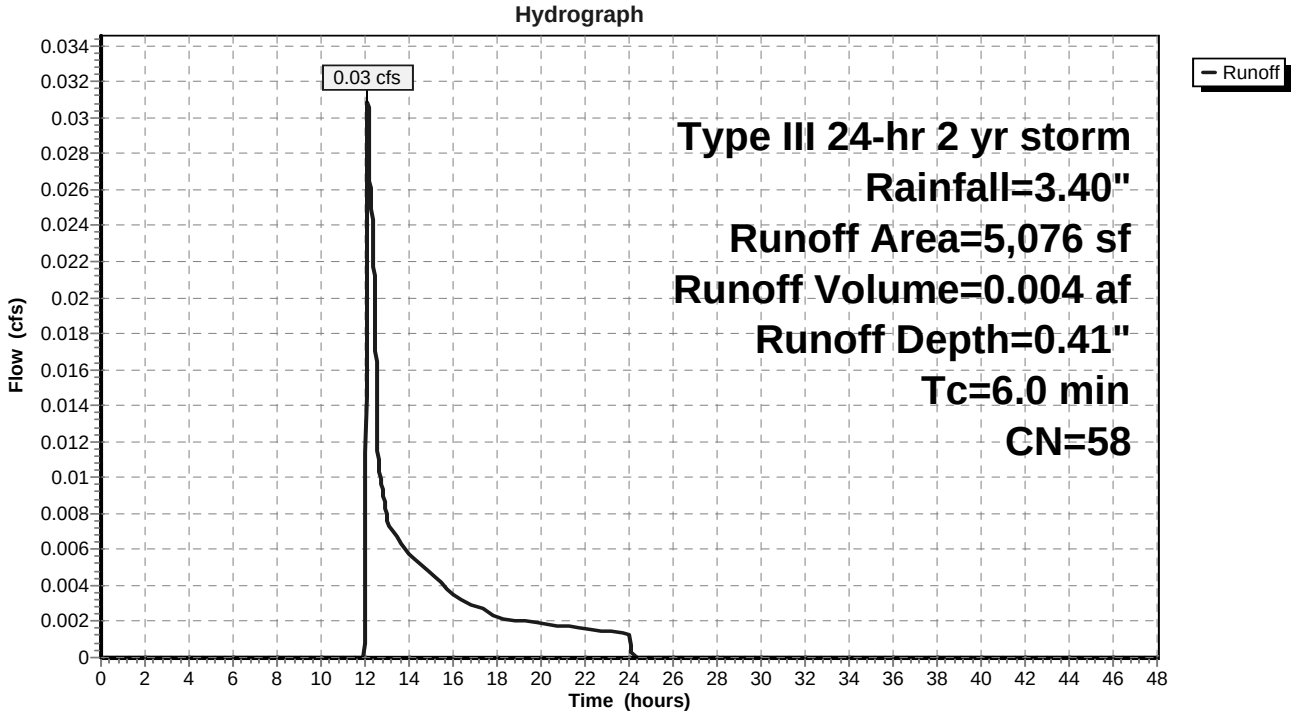
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.004 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 1,404 | 76 | Gravel roads, HSG A |
| 232 | 30 | Woods, Good, HSG A |
| 805 | 98 | paved |
| 2,635 | 39 | >75% Grass cover, Good, HSG A |
| 5,076 | 58 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PRE 3:

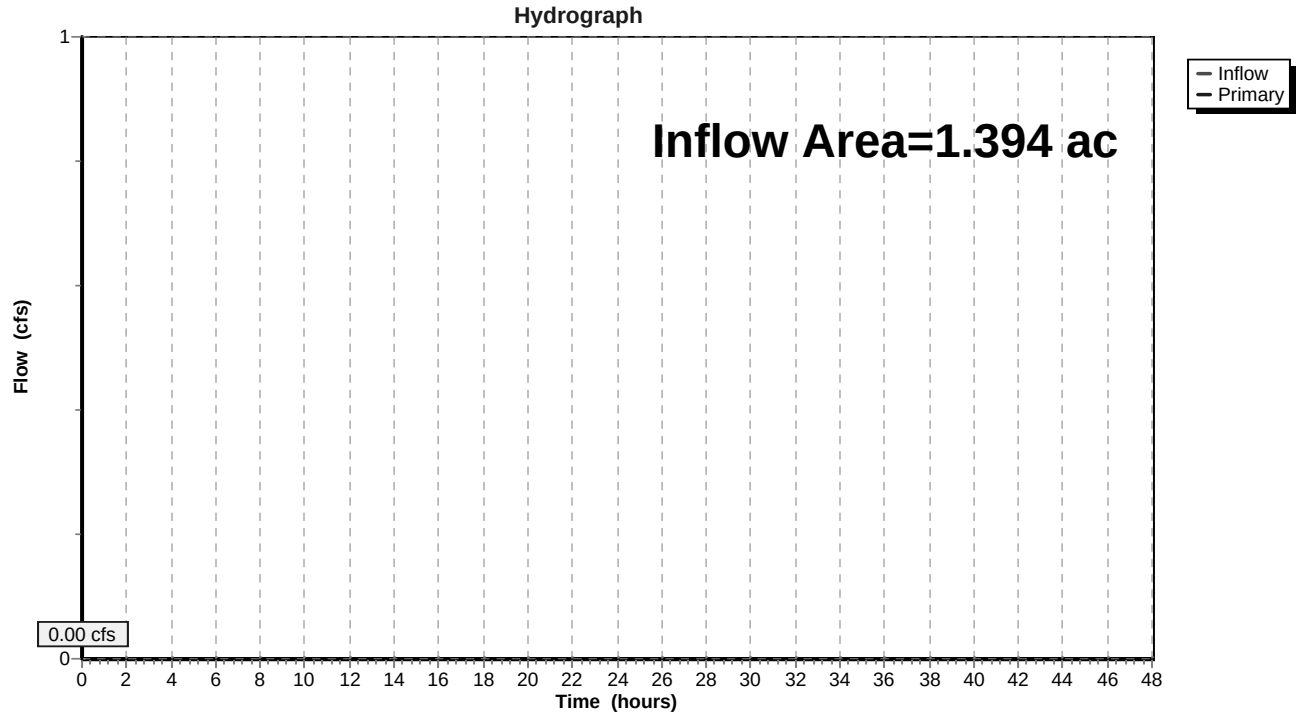


## Pond SUM-1:

Inflow Area = 1.394 ac, Inflow Depth = 0.00" for 2 yr storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-1:

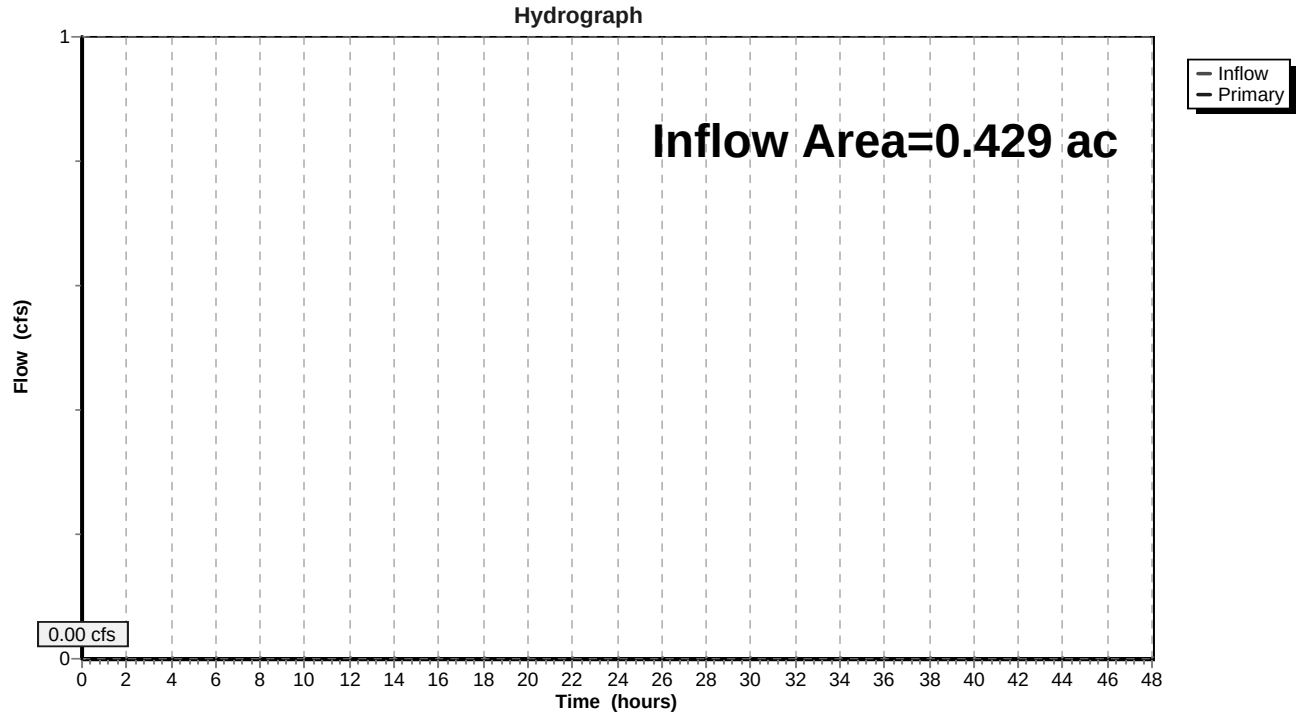


## Pond SUM-2:

Inflow Area = 0.429 ac, Inflow Depth = 0.00" for 2 yr storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-2:

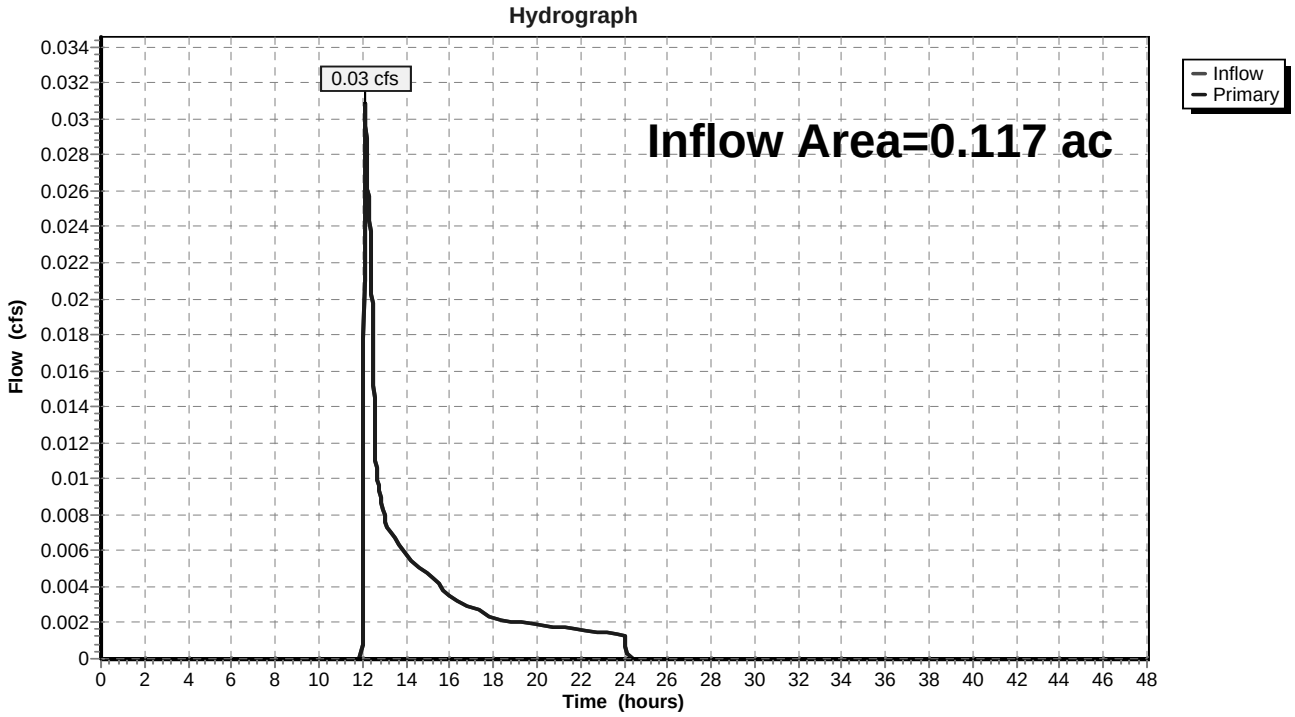


## Pond SUM-3:

Inflow Area = 0.117 ac, Inflow Depth = 0.41" for 2 yr storm event
Inflow = 0.03 cfs @ 12.13 hrs, Volume= 0.004 af
Primary = 0.03 cfs @ 12.13 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-3:



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment PRE 1:** Runoff Area=60,741 sf Runoff Depth=0.08"
Flow Length=203' Tc=16.0 min CN=36 Runoff=0.01 cfs 0.009 af

**Subcatchment PRE 2:** Runoff Area=18,680 sf Runoff Depth=0.08"
Flow Length=73' Tc=12.5 min CN=36 Runoff=0.00 cfs 0.003 af

**Subcatchment PRE 3:** Runoff Area=5,076 sf Runoff Depth=1.06"
Tc=6.0 min CN=58 Runoff=0.12 cfs 0.010 af

**Pond SUM-1:** Inflow=0.01 cfs 0.009 af
Primary=0.01 cfs 0.009 af

**Pond SUM-2:** Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

**Pond SUM-3:** Inflow=0.12 cfs 0.010 af
Primary=0.12 cfs 0.010 af

**Total Runoff Area = 1.940 ac Runoff Volume = 0.023 af Average Runoff Depth = 0.14"**

## Subcatchment PRE 1:

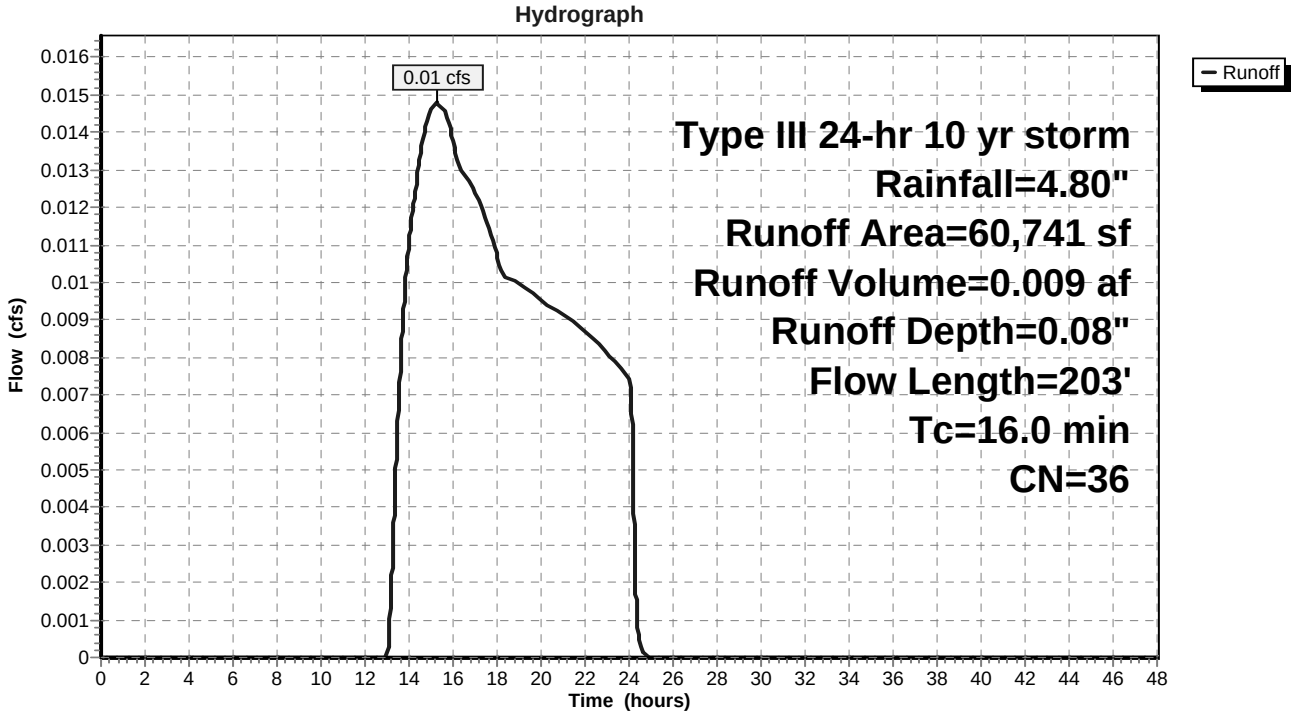
Runoff = 0.01 cfs @ 15.27 hrs, Volume= 0.009 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 46,430 | 36 | Woods, Fair, HSG A |
| 2,868 | 49 | 50-75% Grass cover, Fair, HSG A |
| 246 | 76 | Gravel roads, HSG A |
| 545 | 98 | roof |
| 10,652 | 30 | Woods, Good, HSG A |
| 60,741 | 36 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.0 | 50 | 0.0200 | 0.1 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40" |
| 4.0 | 153 | 0.0163 | 0.6 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.0 | 203 | Total | | | |

## Subcatchment PRE 1:



## Subcatchment PRE 2:

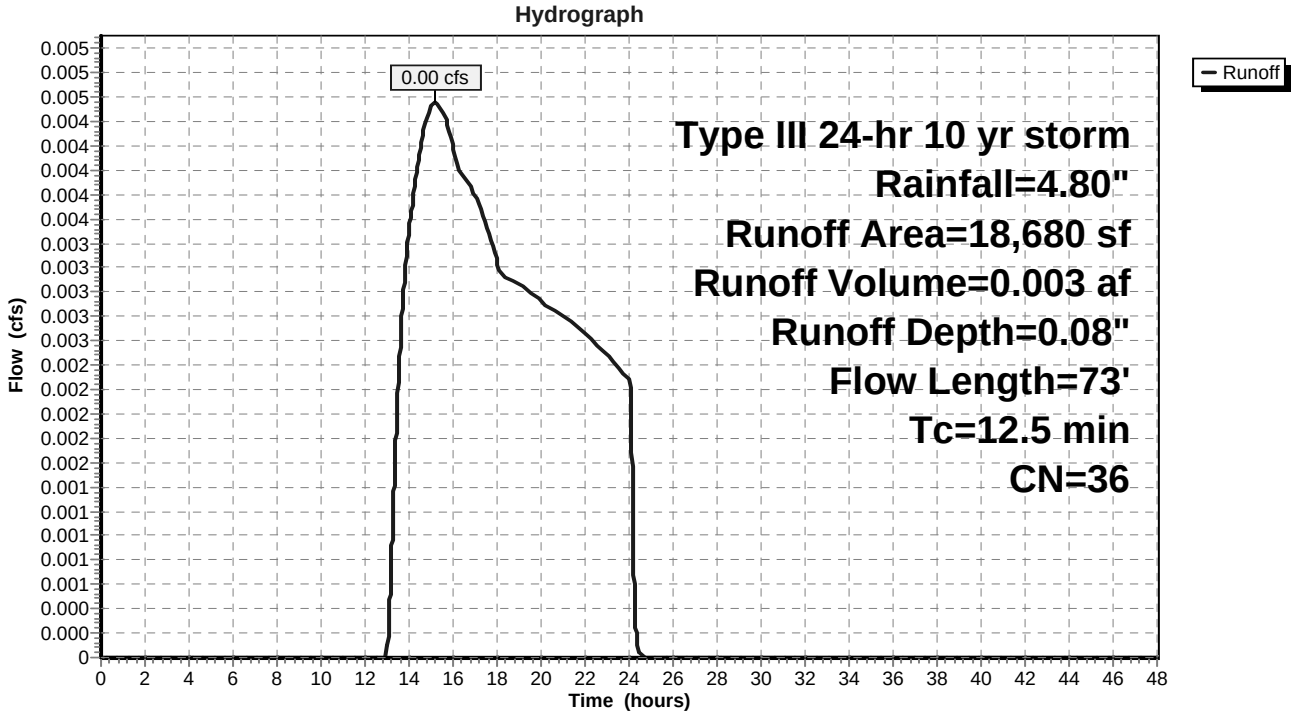
Runoff = 0.00 cfs @ 15.21 hrs, Volume= 0.003 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 18,680 | 36 | Woods, Fair, HSG A |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.0 | 50 | 0.0200 | 0.1 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40" |
| 0.5 | 23 | 0.0200 | 0.7 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.5 | 73 | Total | | | |

## Subcatchment PRE 2:



## Subcatchment PRE 3:

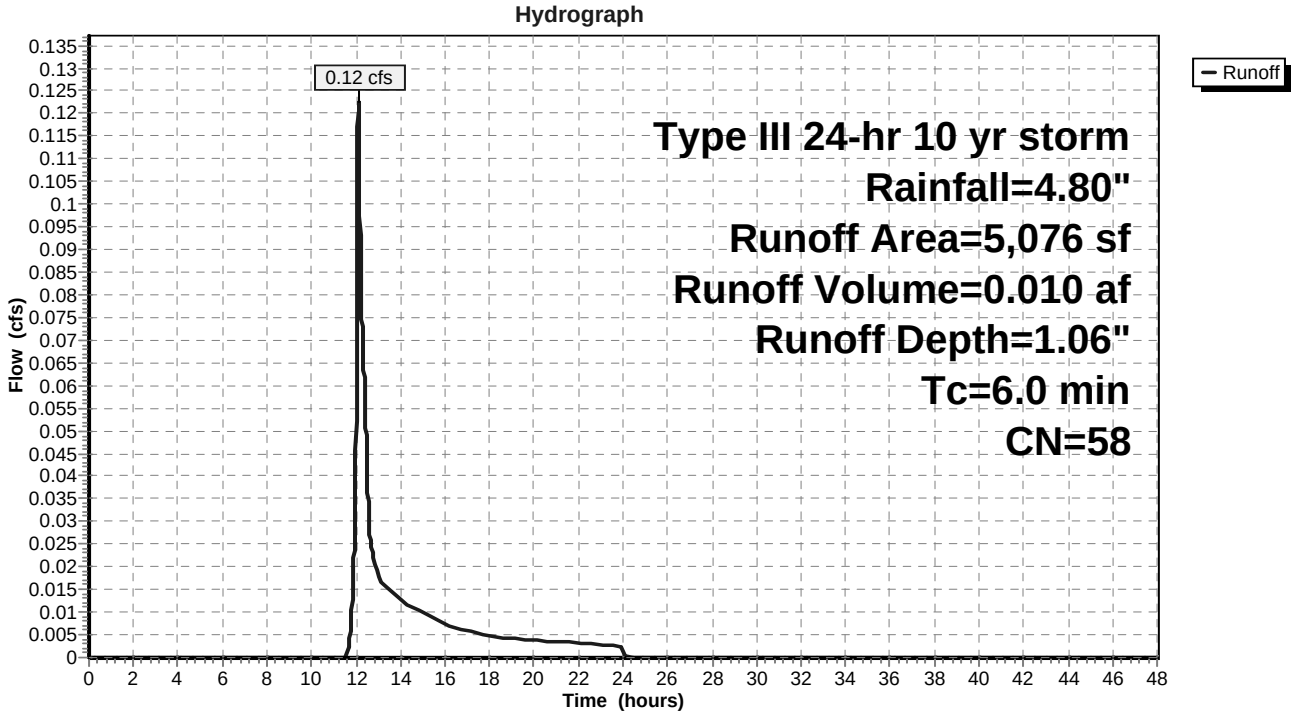
Runoff = 0.12 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 1,404 | 76 | Gravel roads, HSG A |
| 232 | 30 | Woods, Good, HSG A |
| 805 | 98 | paved |
| 2,635 | 39 | >75% Grass cover, Good, HSG A |
| 5,076 | 58 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PRE 3:

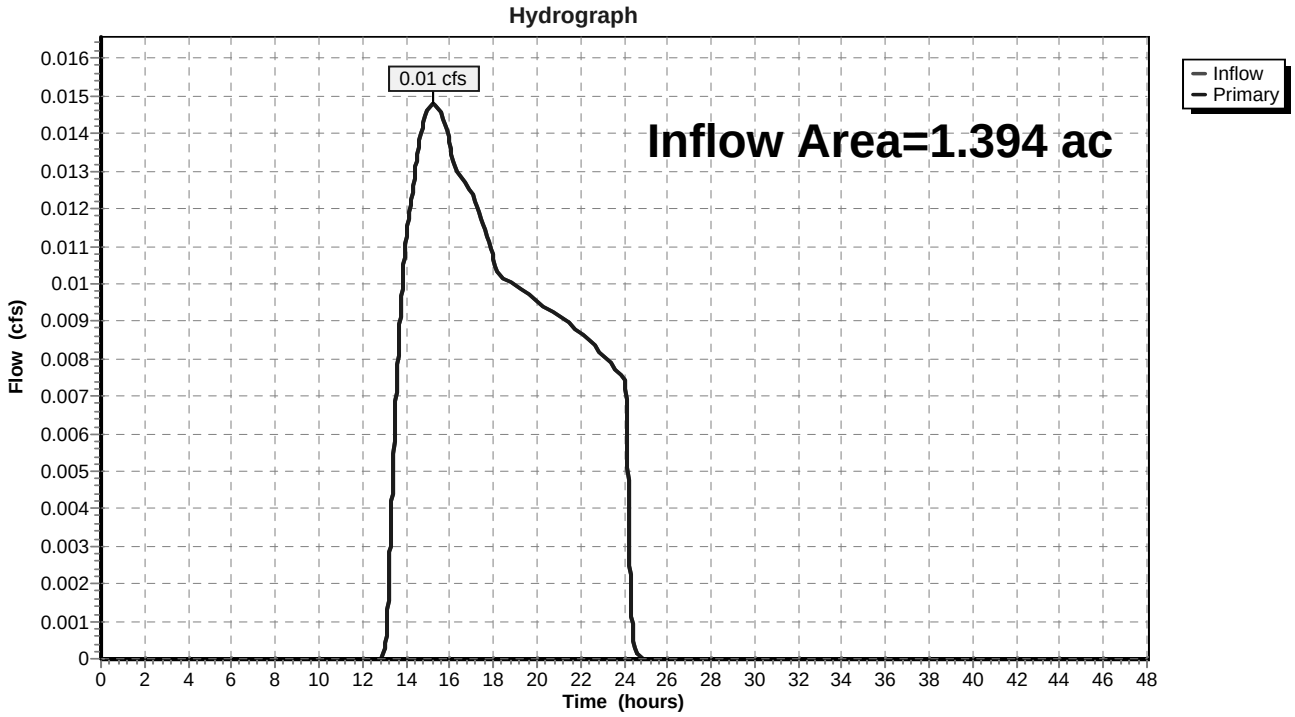


## Pond SUM-1:

Inflow Area = 1.394 ac, Inflow Depth = 0.08" for 10 yr storm event
Inflow = 0.01 cfs @ 15.27 hrs, Volume= 0.009 af
Primary = 0.01 cfs @ 15.27 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-1:

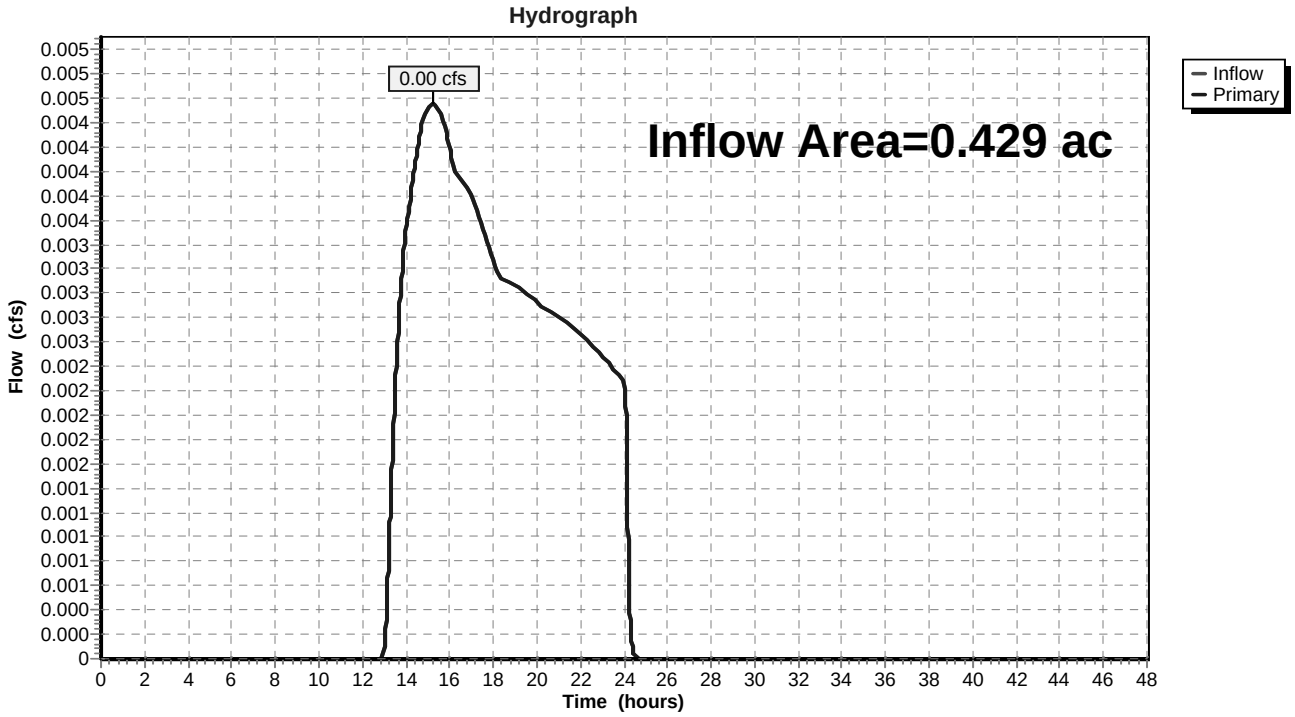


## Pond SUM-2:

Inflow Area = 0.429 ac, Inflow Depth = 0.08" for 10 yr storm event
Inflow = 0.00 cfs @ 15.21 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 15.21 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-2:

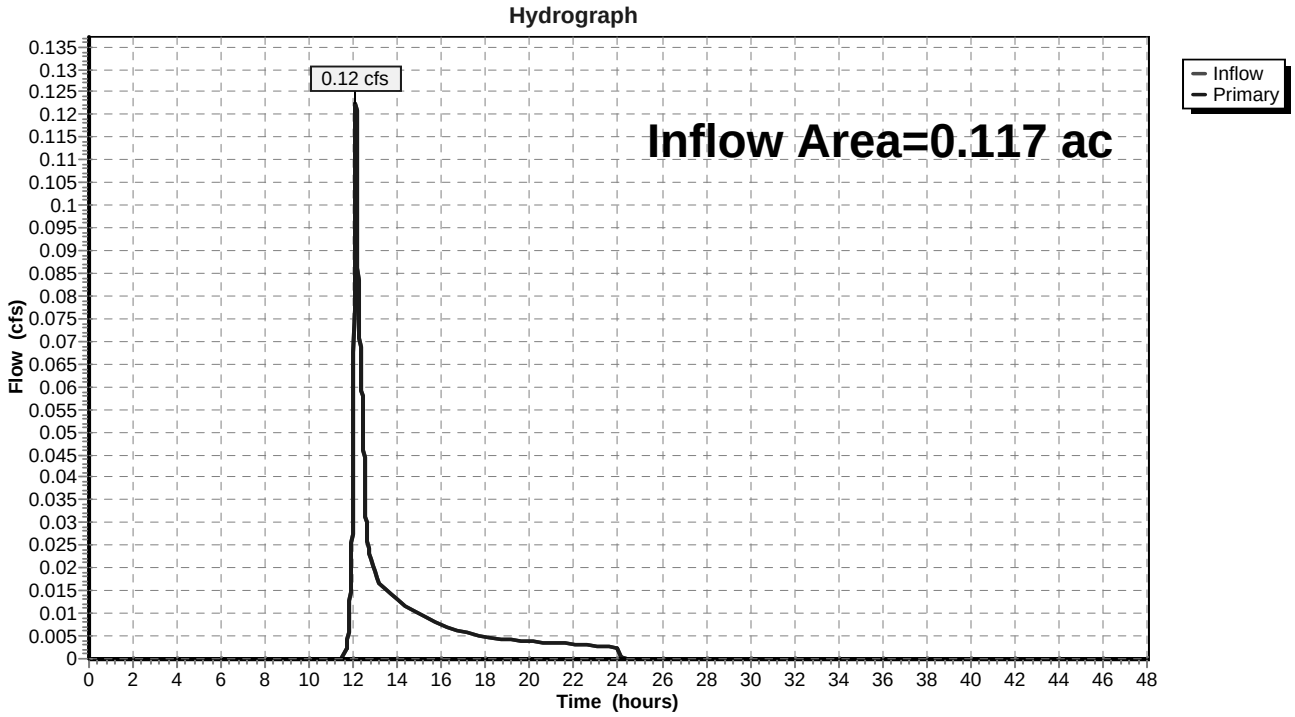


## Pond SUM-3:

Inflow Area = 0.117 ac, Inflow Depth = 1.06" for 10 yr storm event
Inflow = 0.12 cfs @ 12.10 hrs, Volume= 0.010 af
Primary = 0.12 cfs @ 12.10 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-3:



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment PRE 1:** Runoff Area=60,741 sf Runoff Depth=0.56"
Flow Length=203' Tc=16.0 min CN=36 Runoff=0.29 cfs 0.065 af

**Subcatchment PRE 2:** Runoff Area=18,680 sf Runoff Depth=0.56"
Flow Length=73' Tc=12.5 min CN=36 Runoff=0.09 cfs 0.020 af

**Subcatchment PRE 3:** Runoff Area=5,076 sf Runoff Depth=2.41"
Tc=6.0 min CN=58 Runoff=0.32 cfs 0.023 af

**Pond SUM-1:** Inflow=0.29 cfs 0.065 af
Primary=0.29 cfs 0.065 af

**Pond SUM-2:** Inflow=0.09 cfs 0.020 af
Primary=0.09 cfs 0.020 af

**Pond SUM-3:** Inflow=0.32 cfs 0.023 af
Primary=0.32 cfs 0.023 af

**Total Runoff Area = 1.940 ac Runoff Volume = 0.108 af Average Runoff Depth = 0.67"**

## Subcatchment PRE 1:

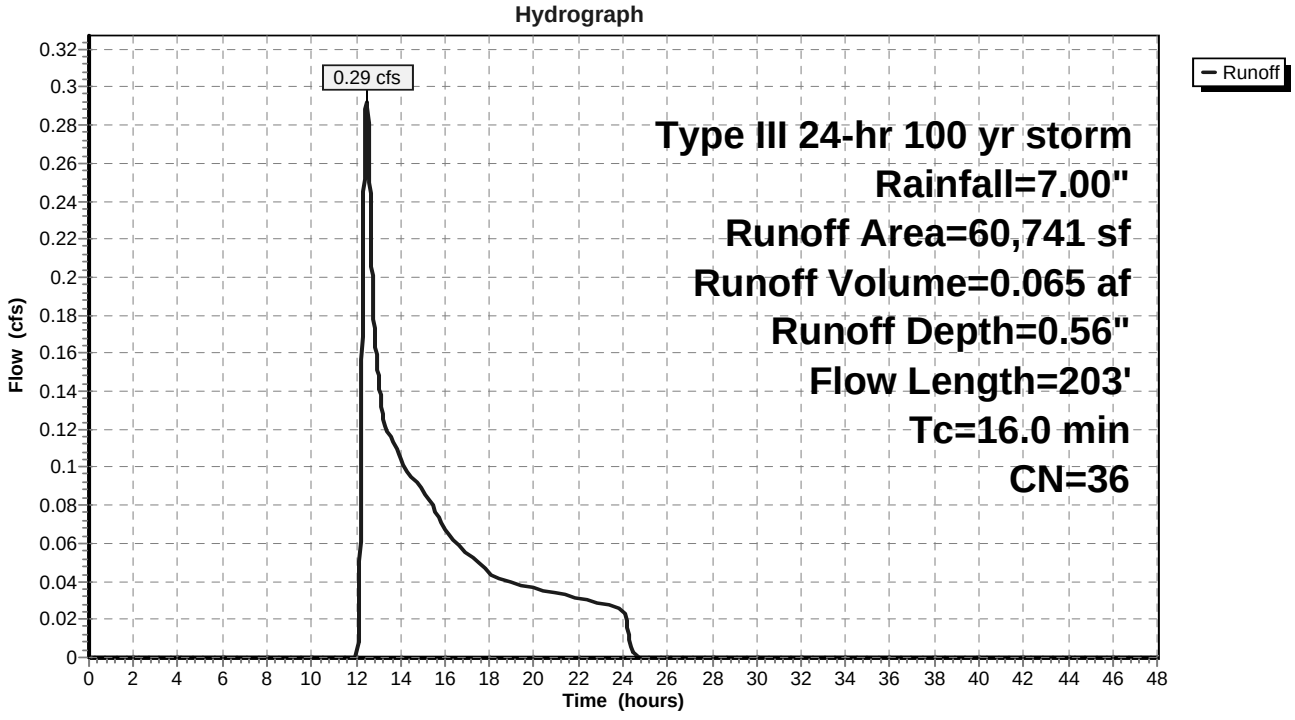
Runoff = 0.29 cfs @ 12.48 hrs, Volume= 0.065 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 46,430 | 36 | Woods, Fair, HSG A |
| 2,868 | 49 | 50-75% Grass cover, Fair, HSG A |
| 246 | 76 | Gravel roads, HSG A |
| 545 | 98 | roof |
| 10,652 | 30 | Woods, Good, HSG A |
| 60,741 | 36 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.0 | 50 | 0.0200 | 0.1 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40" |
| 4.0 | 153 | 0.0163 | 0.6 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.0 | 203 | Total | | | |

## Subcatchment PRE 1:



## Subcatchment PRE 2:

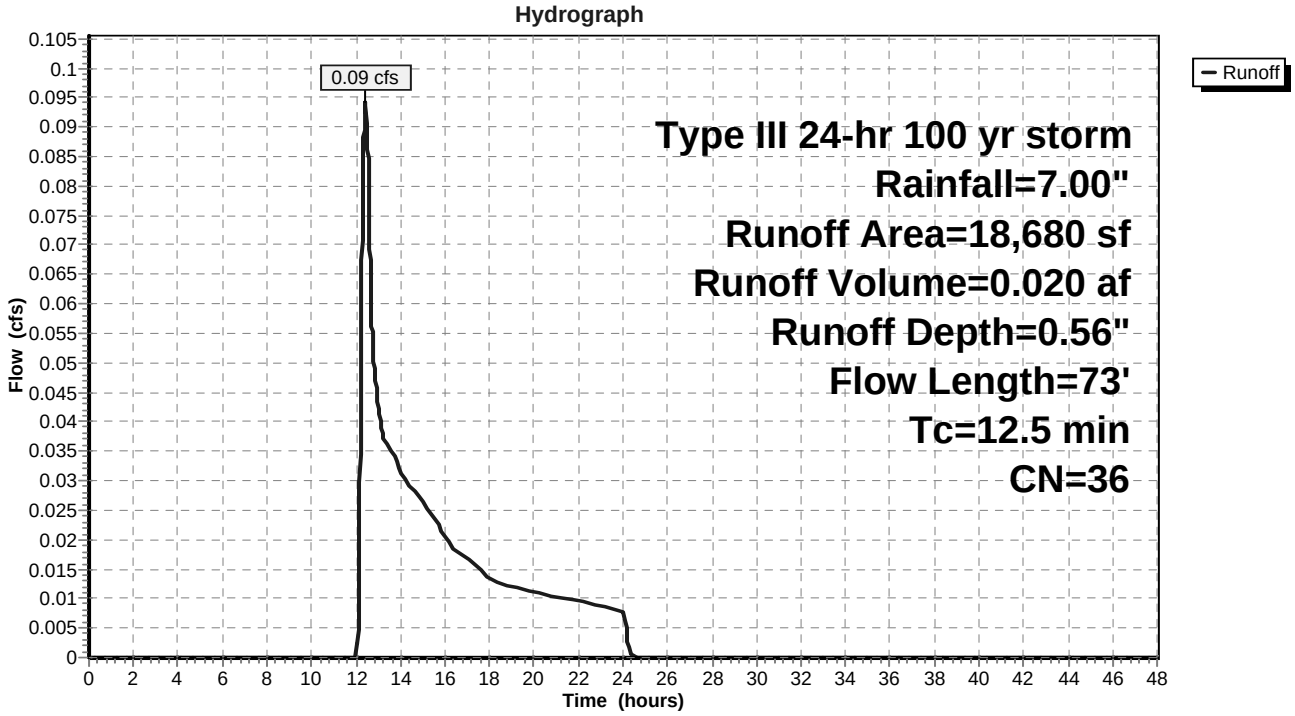
Runoff = 0.09 cfs @ 12.43 hrs, Volume= 0.020 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 18,680 | 36 | Woods, Fair, HSG A |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 12.0 | 50 | 0.0200 | 0.1 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40" |
| 0.5 | 23 | 0.0200 | 0.7 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.5 | 73 | Total | | | |

## Subcatchment PRE 2:



## Subcatchment PRE 3:

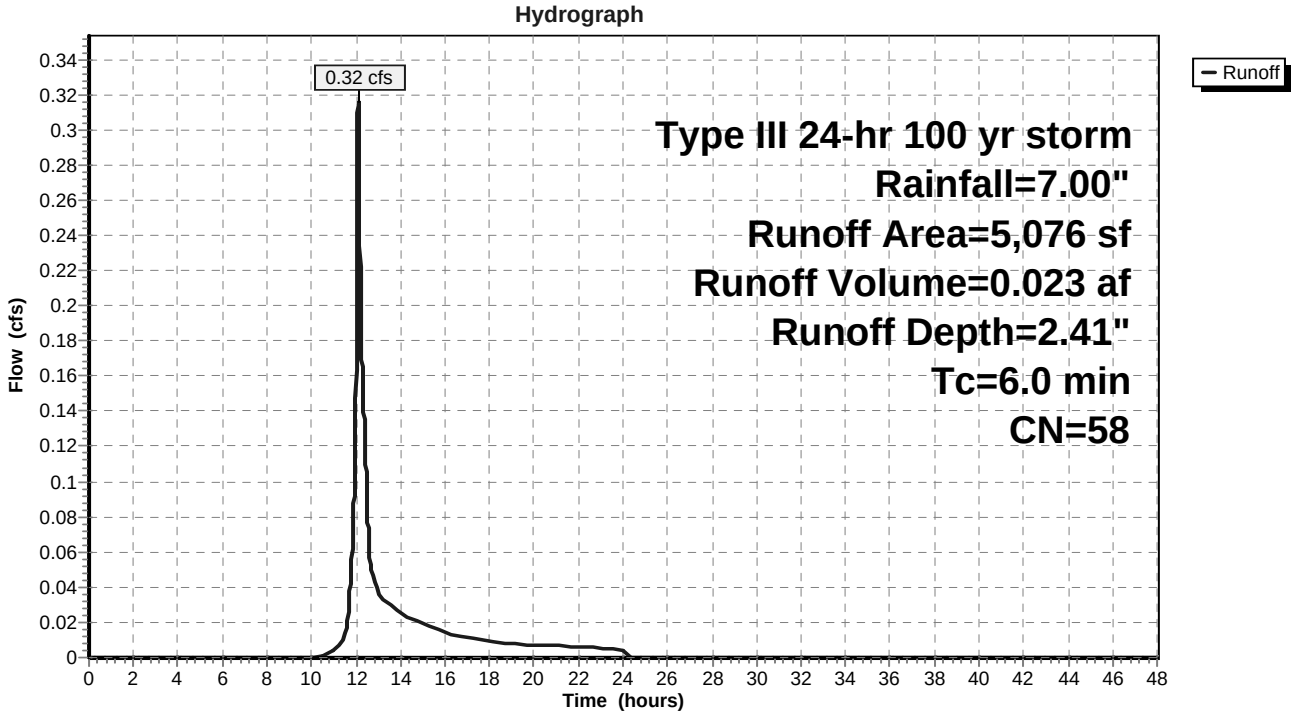
Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 1,404 | 76 | Gravel roads, HSG A |
| 232 | 30 | Woods, Good, HSG A |
| 805 | 98 | paved |
| 2,635 | 39 | >75% Grass cover, Good, HSG A |
| 5,076 | 58 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PRE 3:

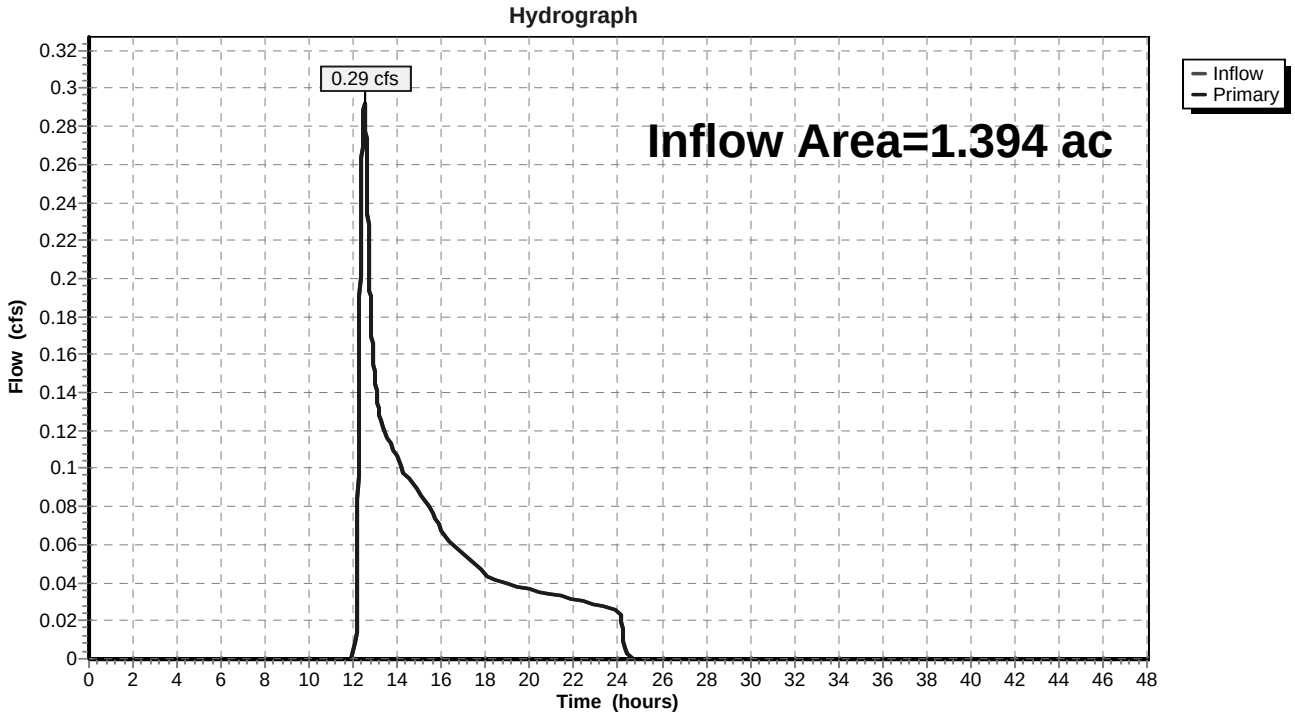


## Pond SUM-1:

Inflow Area = 1.394 ac, Inflow Depth = 0.56" for 100 yr storm event
Inflow = 0.29 cfs @ 12.48 hrs, Volume= 0.065 af
Primary = 0.29 cfs @ 12.48 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-1:

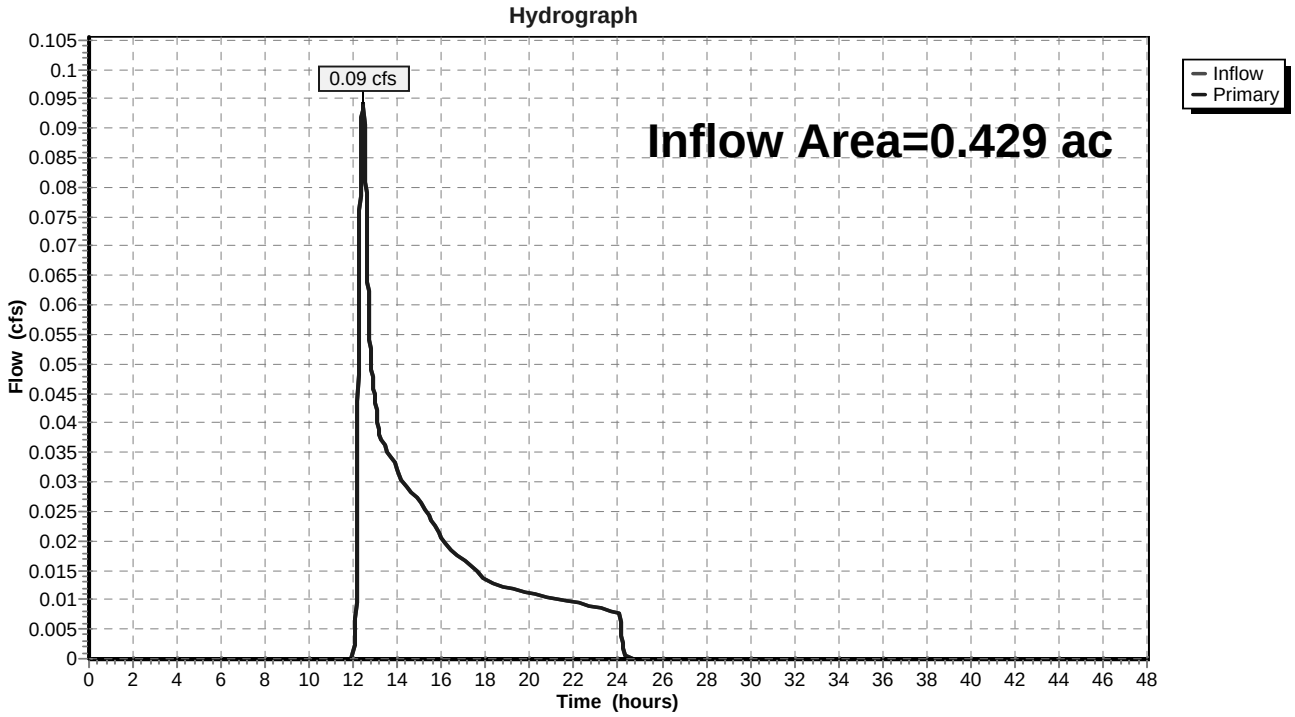


## Pond SUM-2:

Inflow Area = 0.429 ac, Inflow Depth = 0.56" for 100 yr storm event
Inflow = 0.09 cfs @ 12.43 hrs, Volume= 0.020 af
Primary = 0.09 cfs @ 12.43 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-2:

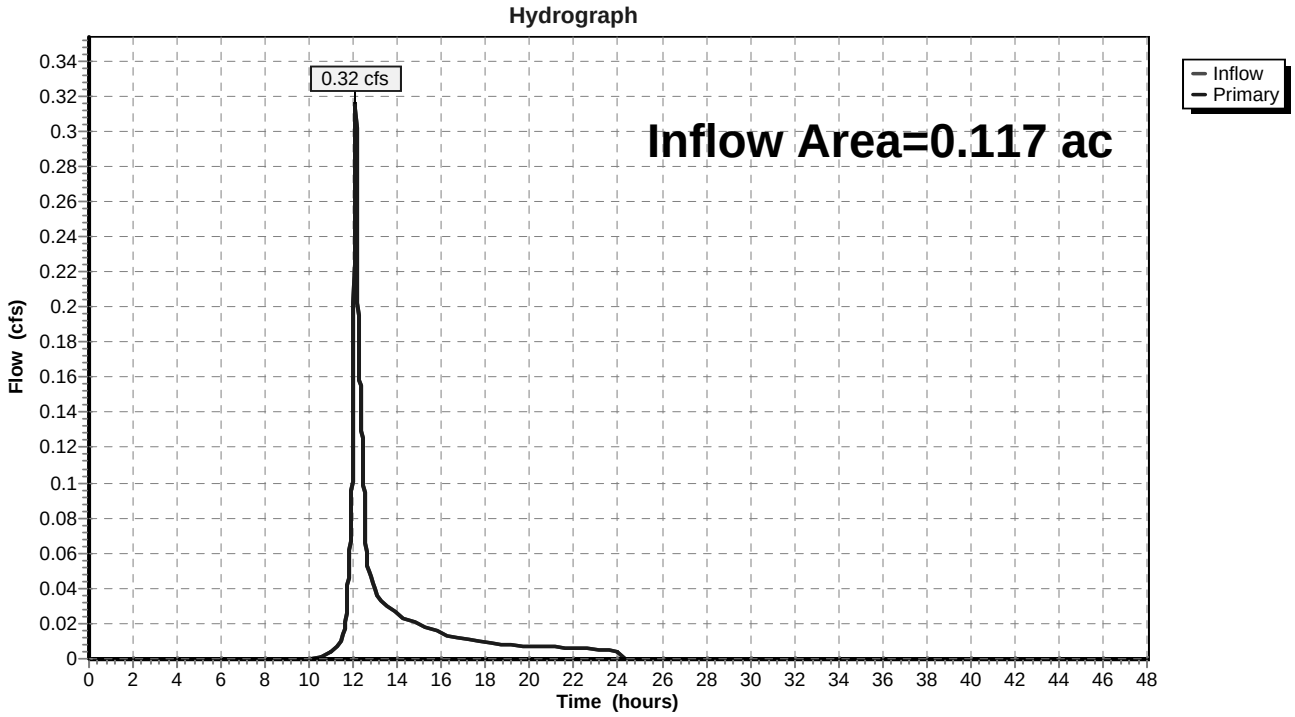


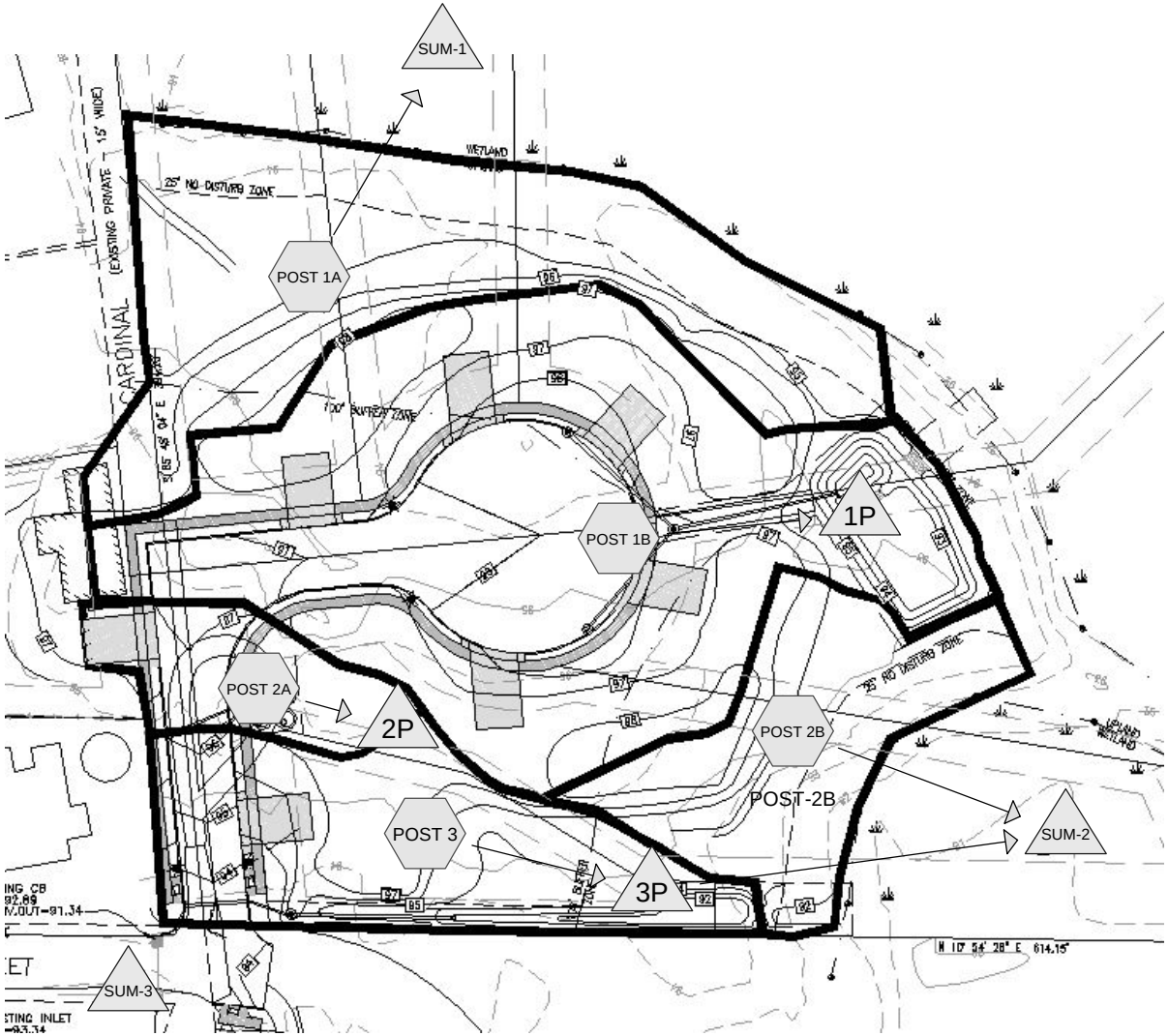
## Pond SUM-3:

Inflow Area = 0.117 ac, Inflow Depth = 2.41" for 100 yr storm event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.023 af
Primary = 0.32 cfs @ 12.09 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Pond SUM-3:






Subcat Reach Pond Link

**Drainage Diagram for POST-development**

Prepared by Prime Engineering, Inc 2/4/2014

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment POST 1A:** Runoff Area=19,494 sf Runoff Depth=0.00"
Flow Length=100' Tc=6.1 min CN=37 Runoff=0.00 cfs 0.000 af

**Subcatchment POST 1B:** Runoff Area=33,648 sf Runoff Depth=0.75"
Flow Length=304' Tc=7.7 min CN=66 Runoff=0.52 cfs 0.048 af

**Subcatchment POST 2A:** Runoff Area=4,752 sf Runoff Depth=0.66"
Tc=6.0 min CN=64 Runoff=0.07 cfs 0.006 af

**Subcatchment POST 2B: POST-2B** Runoff Area=9,634 sf Runoff Depth=0.00"
Flow Length=175' Tc=11.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Subcatchment POST 3:** Runoff Area=12,057 sf Runoff Depth=0.13"
Tc=6.0 min CN=48 Runoff=0.01 cfs 0.003 af

**Pond 1P:** Peak Elev=93.09' Storage=145 cf Inflow=0.52 cfs 0.048 af
Outflow=0.32 cfs 0.048 af

**Pond 2P:** Peak Elev=92.57' Storage=12 cf Inflow=0.07 cfs 0.006 af
Outflow=0.05 cfs 0.006 af

**Pond 3P:** Peak Elev=92.28' Storage=127 cf Inflow=0.01 cfs 0.003 af
Outflow=0.00 cfs 0.000 af

**Pond SUM-1:** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Pond SUM-2:** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Pond SUM-3:**

**Total Runoff Area = 1.827 ac Runoff Volume = 0.057 af Average Runoff Depth = 0.37"**

## Subcatchment POST 1A:

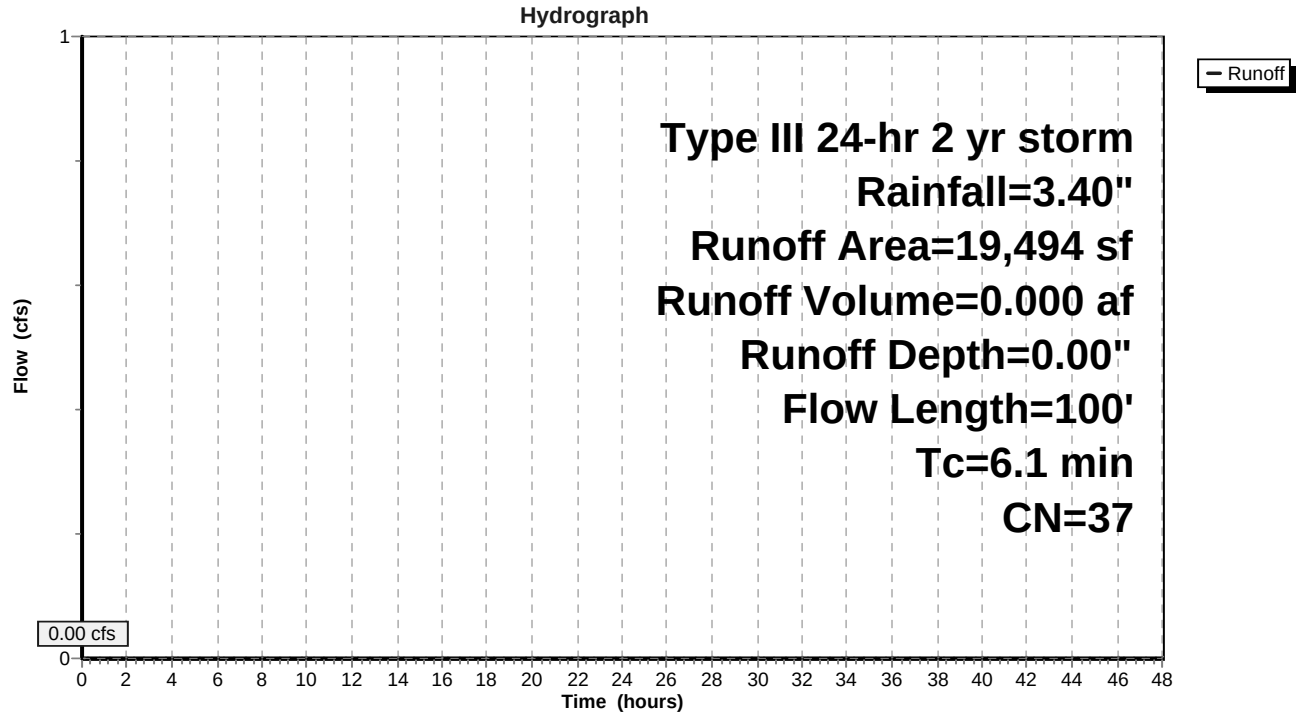
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 2647 roof (sent to inf) |
| 9,587 | 39 | >75% Grass cover, Good, HSG A |
| 9,907 | 36 | Woods, Fair, HSG A |
| 19,494 | 37 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.6 | 50 | 0.0300 | 0.2 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 1.5 | 50 | 0.0130 | 0.6 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.1 | 100 | Total | | | |

## Subcatchment POST 1A:



## Subcatchment POST 1B:

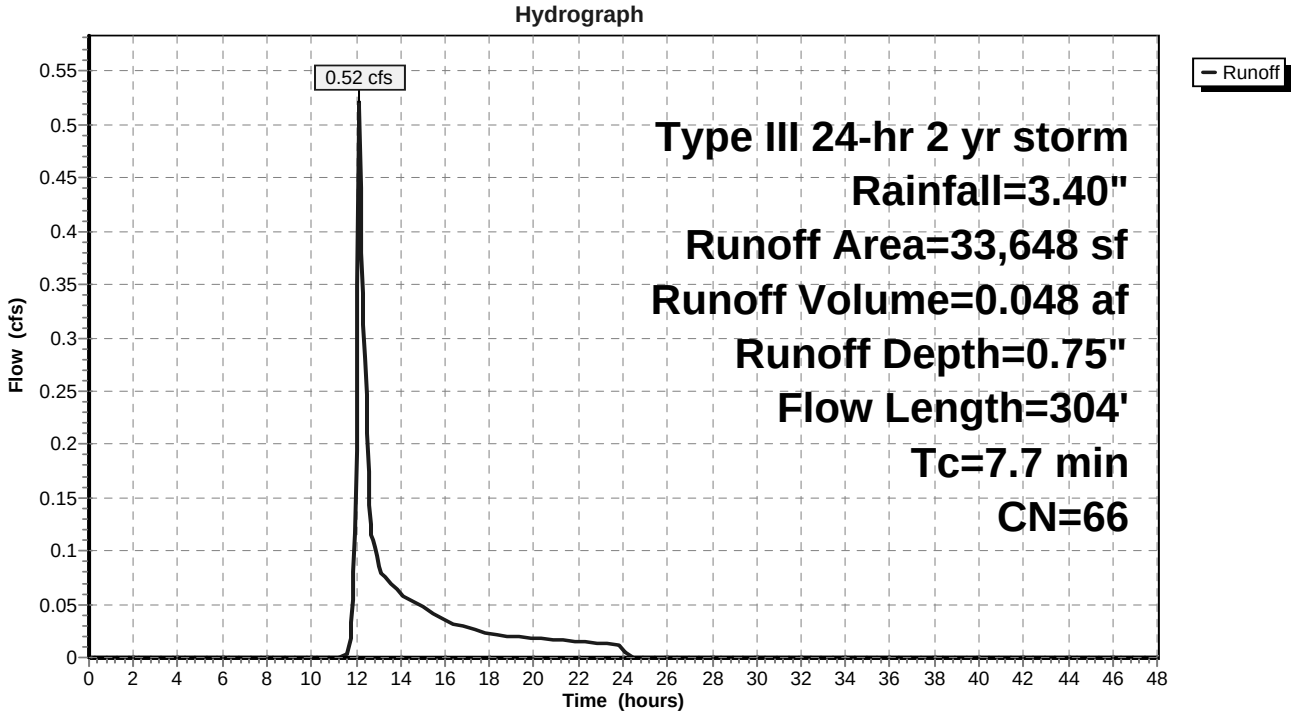
Runoff = 0.52 cfs @ 12.13 hrs, Volume= 0.048 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 3360 SF roof (sent to infiltrator) |
| 10,507 | 98 | Paved roads w/curbs & sewers |
| 3,047 | 98 | Driveways |
| 1,784 | 98 | Basin |
| 18,310 | 39 | >75% Grass cover, Good, HSG A |
| 33,648 | 66 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.2 | 37 | 0.0080 | 0.1 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 0.9 | 131 | 0.0145 | 2.4 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 136 | 0.0080 | 4.1 | 3.19 | **Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 7.7 | 304 | Total | | | |

## Subcatchment POST 1B:



## Subcatchment POST 2A:

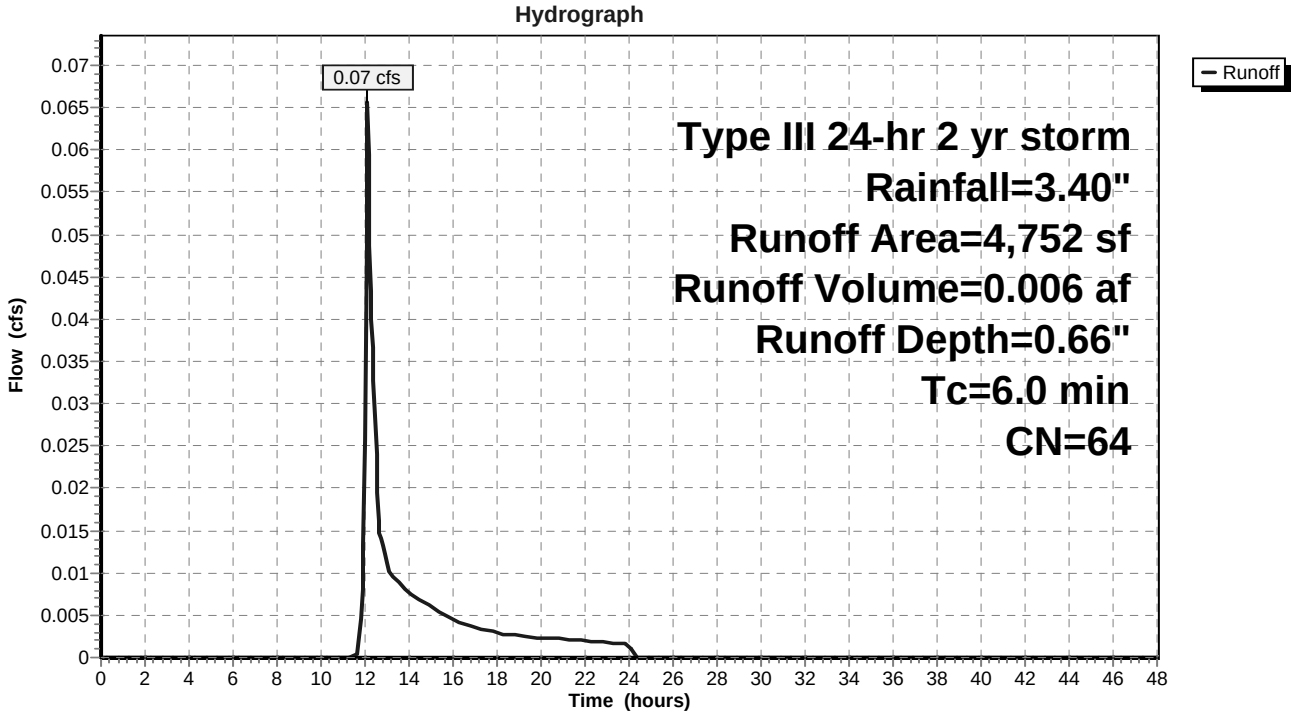
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 2,021 | 98 | Paved roads w/curbs & sewers |
| 2,731 | 39 | >75% Grass cover, Good, HSG A |
| 4,752 | 64 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment POST 2A:



## Subcatchment POST 2B: POST-2B

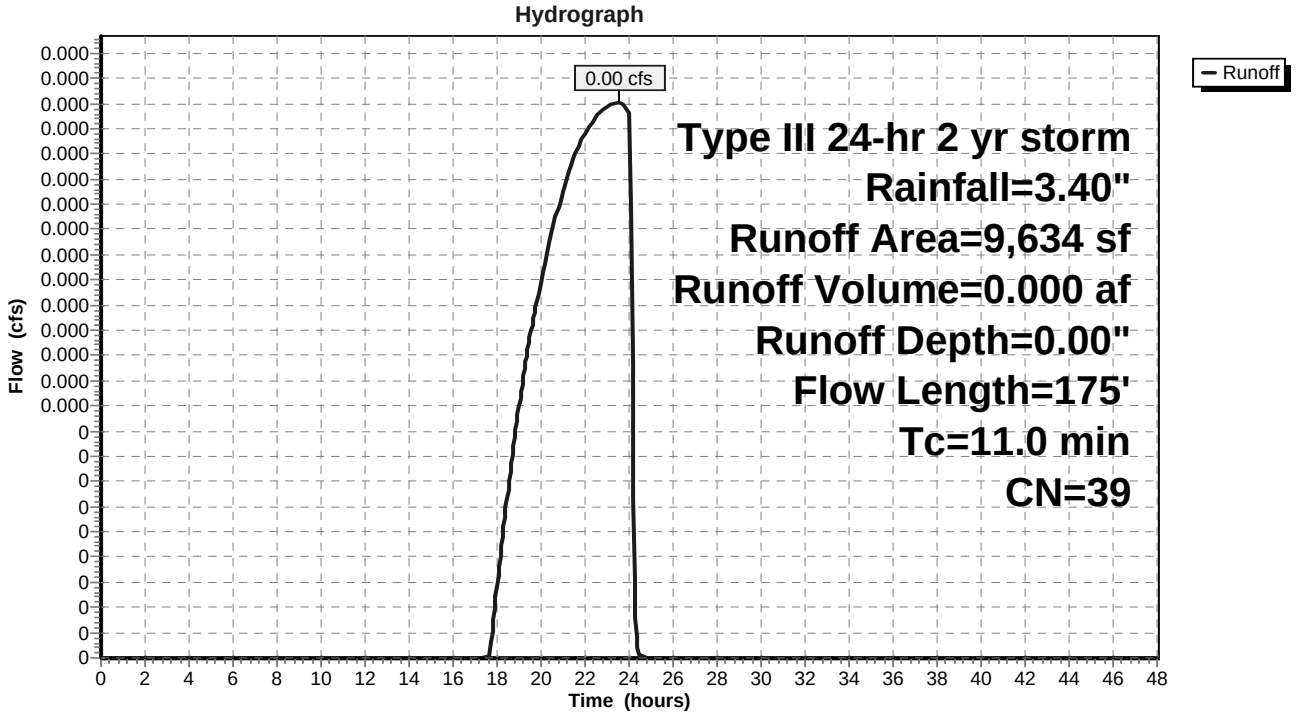
Runoff = 0.00 cfs @ 23.51 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 2,481 SF Roofs (sent to infiltrator) |
| 9,634 | 39 | >75% Grass cover, Good, HSG A |
| 9,634 | 39 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0050 | 0.1 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 1.5 | 125 | 0.0400 | 1.4 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 11.0 | 175 | Total | | | |

## Subcatchment POST 2B: POST-2B



## Subcatchment POST 3:

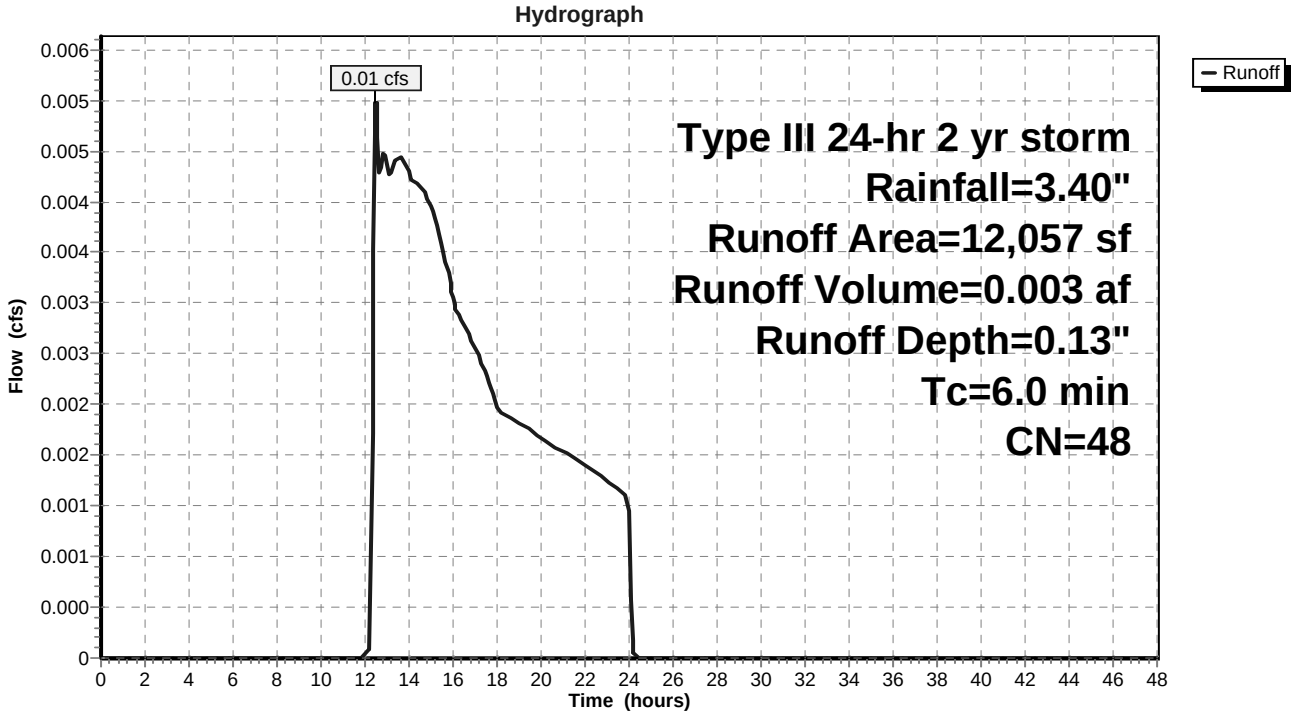
Runoff = 0.01 cfs @ 12.50 hrs, Volume= 0.003 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr storm Rainfall=3.40"

| Area (sf) | CN | Description |
|---|---|---|
| 1,933 | 98 | PAVED AND SIDEWALK |
| 0 | 98 | 1176 ROOF INFILTRATED |
| 10,124 | 39 | >75% Grass cover, Good, HSG A |
| 12,057 | 48 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment POST 3:



## Pond 1P:

Inflow Area = 0.772 ac, Inflow Depth = 0.75" for 2 yr storm event
Inflow = 0.52 cfs @ 12.13 hrs, Volume= 0.048 af
Outflow = 0.32 cfs @ 12.34 hrs, Volume= 0.048 af, Atten= 39%, Lag= 12.7 min
Discarded = 0.32 cfs @ 12.34 hrs, Volume= 0.048 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 93.09' @ 12.34 hrs Surf.Area= 1,648 sf Storage= 145 cf
Plug-Flow detention time= 3.0 min calculated for 0.048 af (100% of inflow)
Center-of-Mass det. time= 3.0 min ( 890.2 - 887.2 )

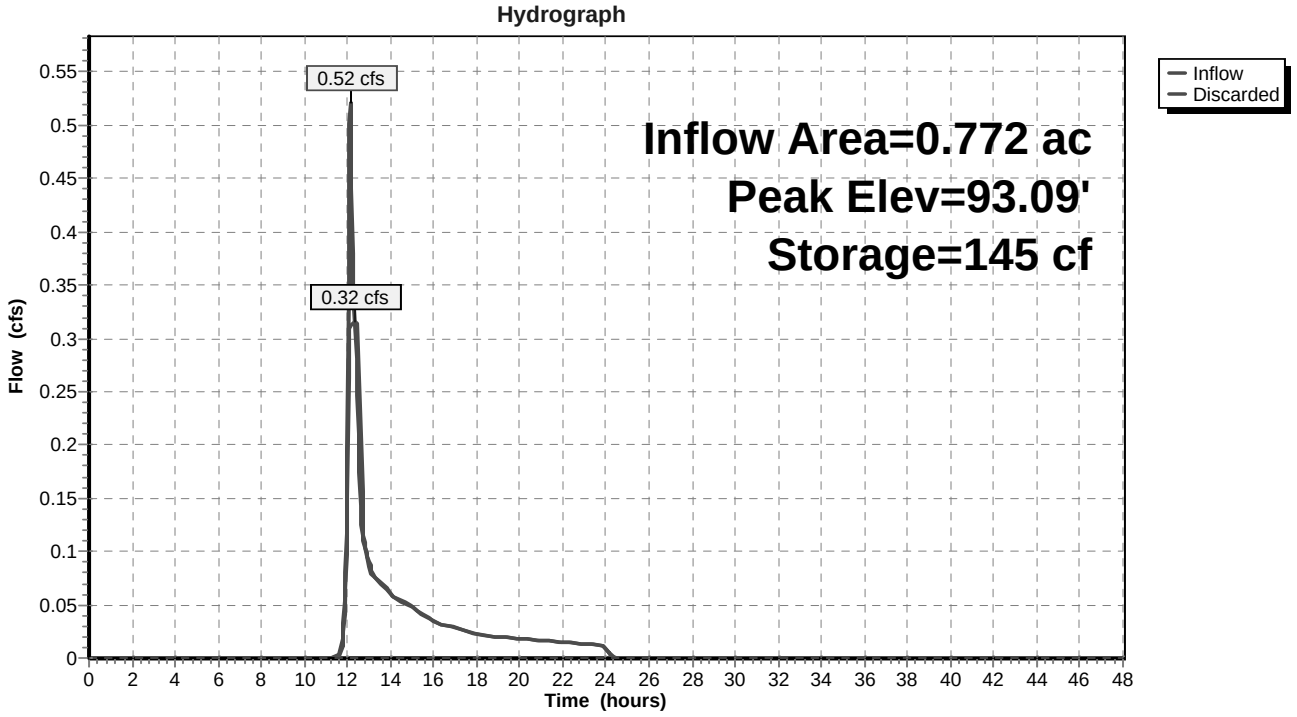
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 93.00' | 4,305 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 93.00 | 1,600 | 0 | 0 |
| 94.00 | 2,138 | 1,869 | 1,869 |
| 95.00 | 2,733 | 2,436 | 4,305 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 0.00' | **8.270 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.32 cfs @ 12.34 hrs HW=93.09' (Free Discharge)
**1=Exfiltration** (Exfiltration Controls 0.32 cfs)

## Pond 1P:



## Pond 2P:

Inflow Area = 0.109 ac, Inflow Depth = 0.66" for 2 yr storm event
Inflow = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af
Outflow = 0.05 cfs @ 12.10 hrs, Volume= 0.006 af, Atten= 27%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.10 hrs, Volume= 0.006 af

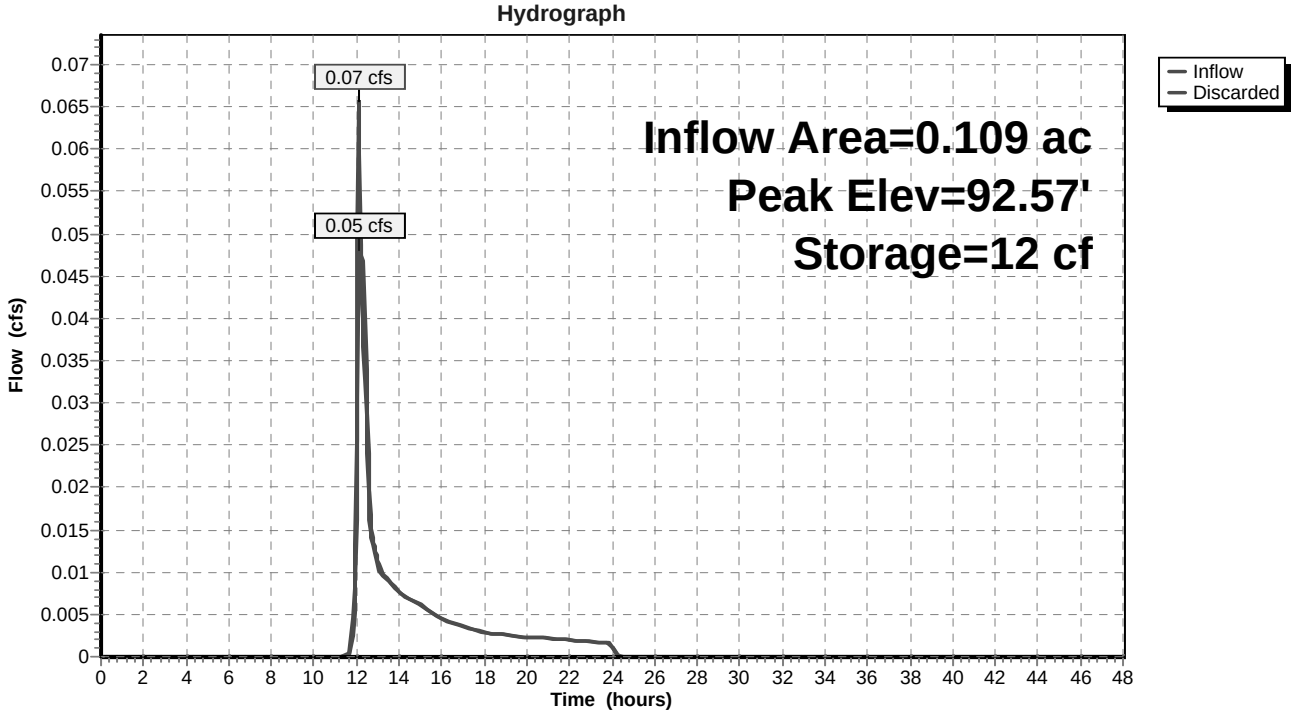
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 92.57' @ 12.21 hrs Surf.Area= 251 sf Storage= 12 cf
Plug-Flow detention time= 3.0 min calculated for 0.006 af (100% of inflow)
Center-of-Mass det. time= 3.0 min ( 896.7 - 893.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 92.50' | 226 cf | **8.00'D x 4.50'H Vertical Cone/Cylinder** x 5<br>1,131 cf Overall - 565 cf Embedded = 565 cf x 40.0% Voids |
| #2 | 92.50' | 565 cf | **6.00'D x 4.00'H Vertical Cone/Cylinder** x 5 Inside #1 |
| | | 792 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 0.00' | **8.270 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.05 cfs @ 12.10 hrs HW=92.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

## Pond 2P:



## Pond 3P:

Inflow Area = 0.277 ac, Inflow Depth = 0.13" for 2 yr storm event
Inflow = 0.01 cfs @ 12.50 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 92.28' @ 24.40 hrs Surf.Area= 509 sf Storage= 127 cf
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

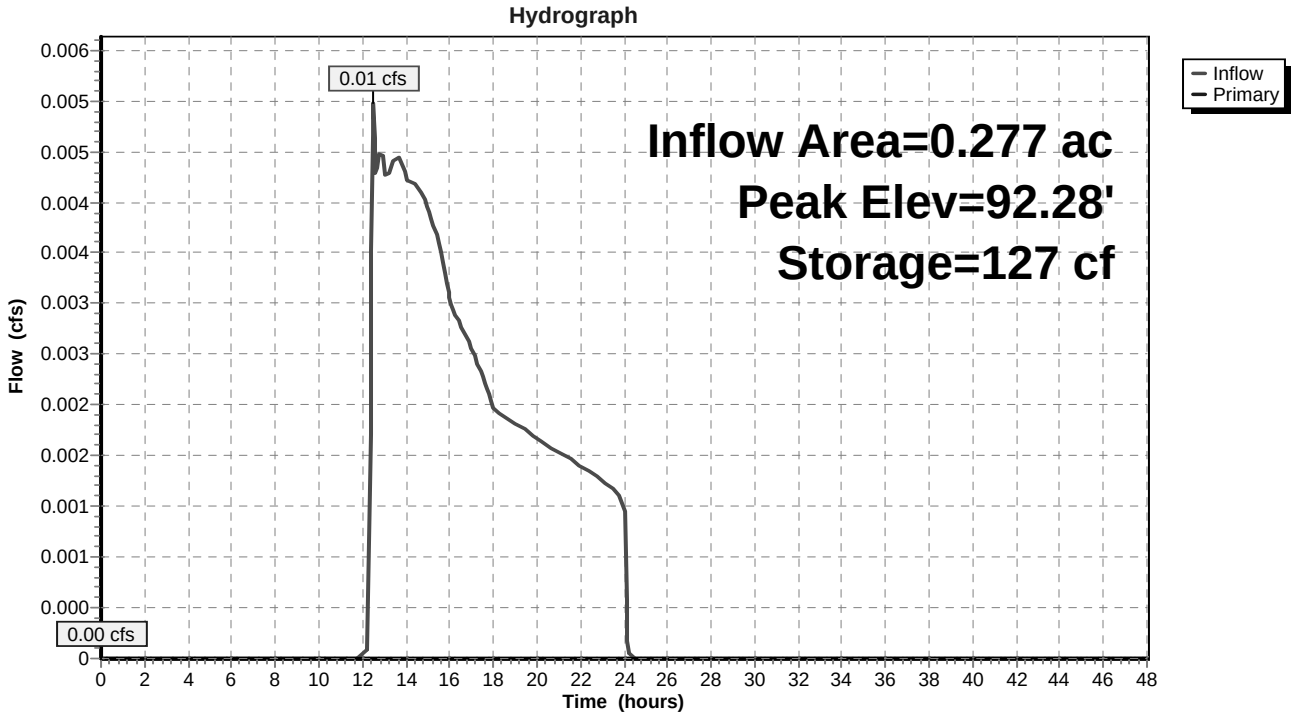
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 92.00' | 590 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 92.00 | 411 | 0 | 0 |
| 93.00 | 768 | 590 | 590 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 92.95' | **4.0' long x 4.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=92.00' (Free Discharge)
**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 3P:

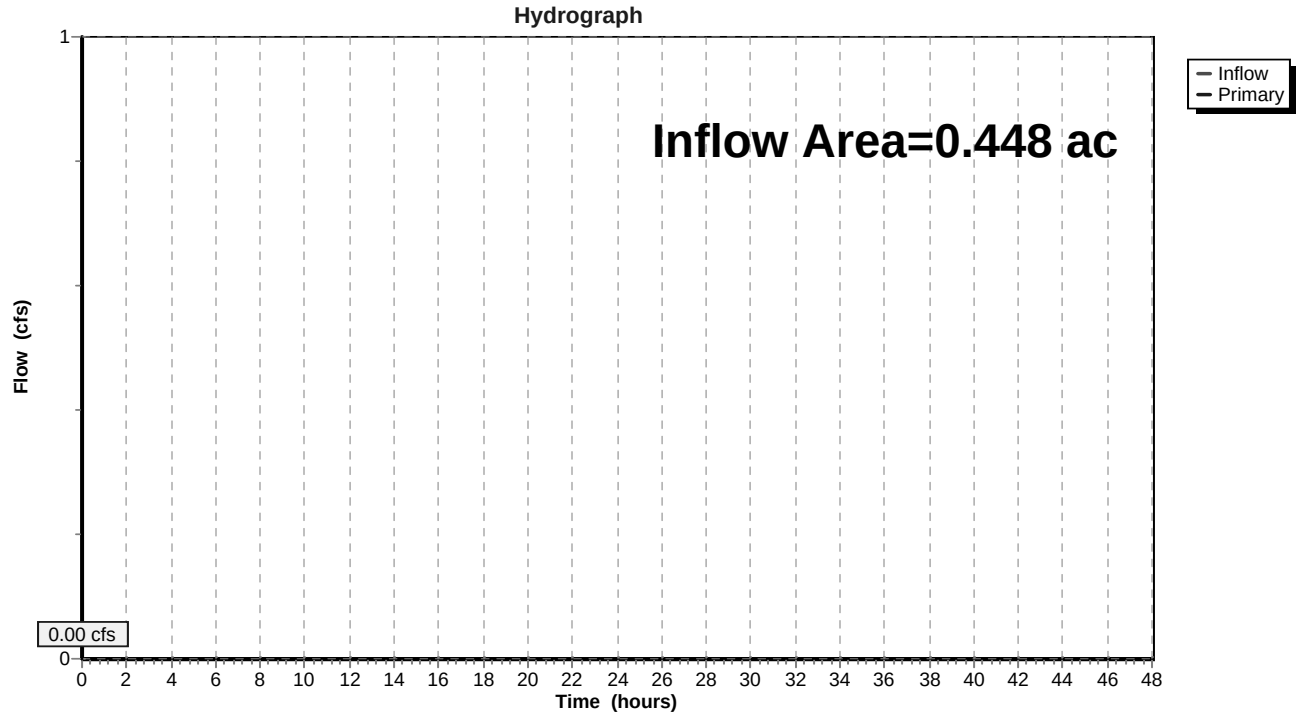

Hydrograph
Inflow Area=0.277 ac
Peak Elev=92.28'
Storage=127 cf
0.01 cfs
0.00 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0.006
0.005
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

## Pond SUM-1:

Inflow Area = 0.448 ac, Inflow Depth = 0.00" for 2 yr storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

## Pond SUM-1:

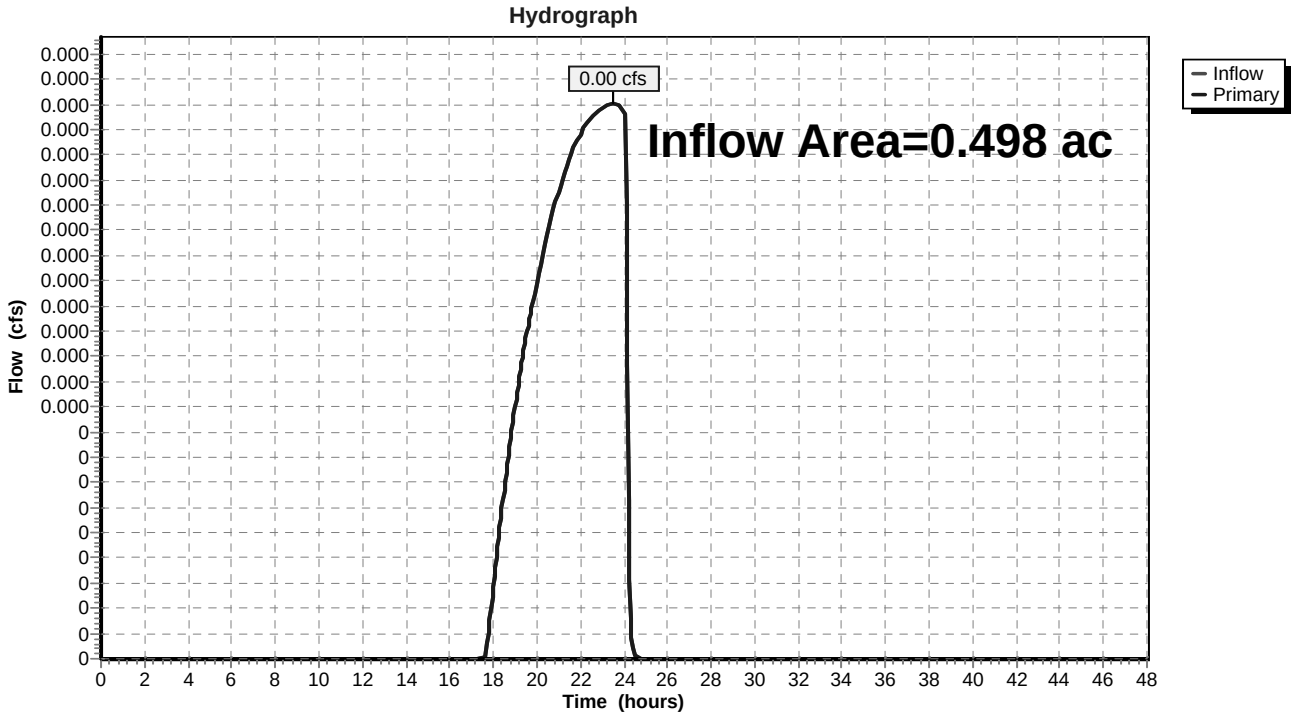


## Pond SUM-2:

Inflow Area = 0.498 ac, Inflow Depth = 0.00" for 2 yr storm event
Inflow = 0.00 cfs @ 23.51 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 23.51 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

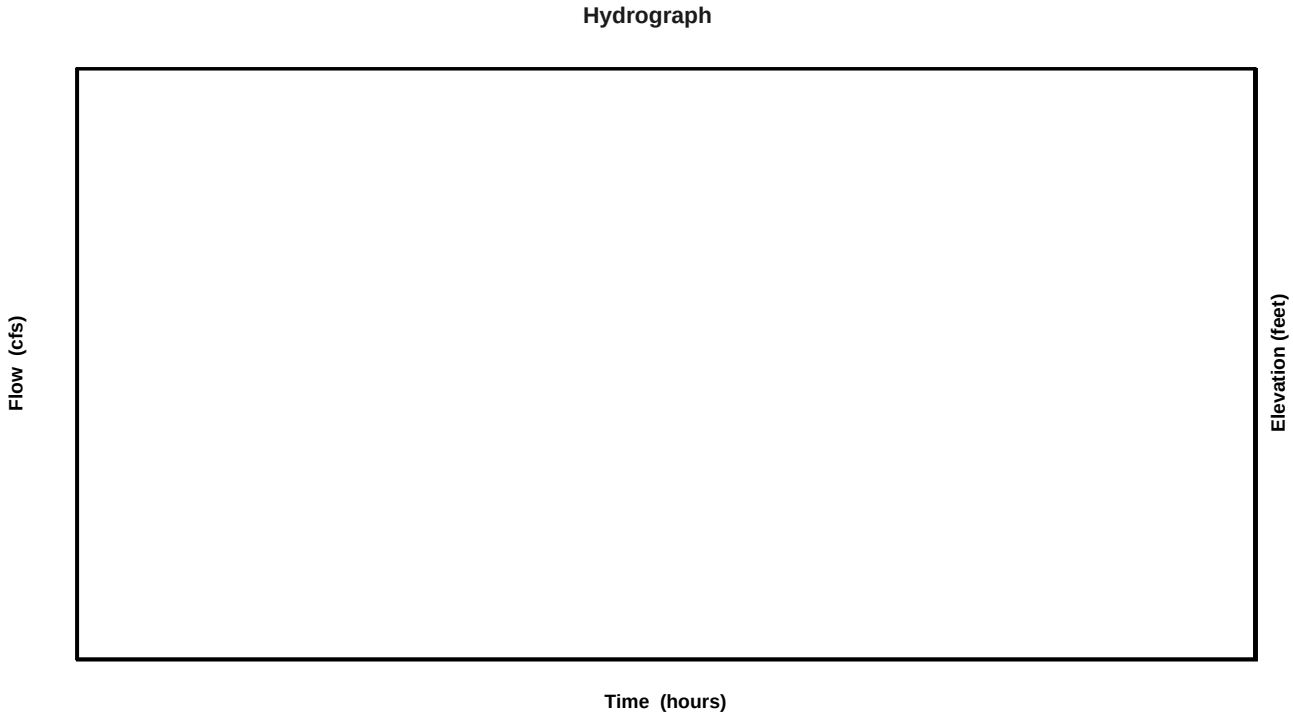
## Pond SUM-2:



## Pond SUM-3:

Routing by Stor-Ind method

## Pond SUM-3:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment POST 1A:** Runoff Area=19,494 sf Runoff Depth=0.11"
Flow Length=100' Tc=6.1 min CN=37 Runoff=0.01 cfs 0.004 af

**Subcatchment POST 1B:** Runoff Area=33,648 sf Runoff Depth=1.59"
Flow Length=304' Tc=7.7 min CN=66 Runoff=1.27 cfs 0.103 af

**Subcatchment POST 2A:** Runoff Area=4,752 sf Runoff Depth=1.45"
Tc=6.0 min CN=64 Runoff=0.17 cfs 0.013 af

**Subcatchment POST 2B: POST-2B** Runoff Area=9,634 sf Runoff Depth=0.16"
Flow Length=175' Tc=11.0 min CN=39 Runoff=0.00 cfs 0.003 af

**Subcatchment POST 3:** Runoff Area=12,057 sf Runoff Depth=0.51"
Tc=6.0 min CN=48 Runoff=0.08 cfs 0.012 af

**Pond 1P:** Peak Elev=93.54' Storage=941 cf Inflow=1.27 cfs 0.103 af
Outflow=0.36 cfs 0.103 af

**Pond 2P:** Peak Elev=93.11' Storage=113 cf Inflow=0.17 cfs 0.013 af
Outflow=0.05 cfs 0.013 af

**Pond 3P:** Peak Elev=92.90' Storage=517 cf Inflow=0.08 cfs 0.012 af
Outflow=0.00 cfs 0.000 af

**Pond SUM-1:** Inflow=0.01 cfs 0.004 af
Primary=0.01 cfs 0.004 af

**Pond SUM-2:** Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

**Pond SUM-3:**

**Total Runoff Area = 1.827 ac Runoff Volume = 0.135 af Average Runoff Depth = 0.88"**

## Subcatchment POST 1A:

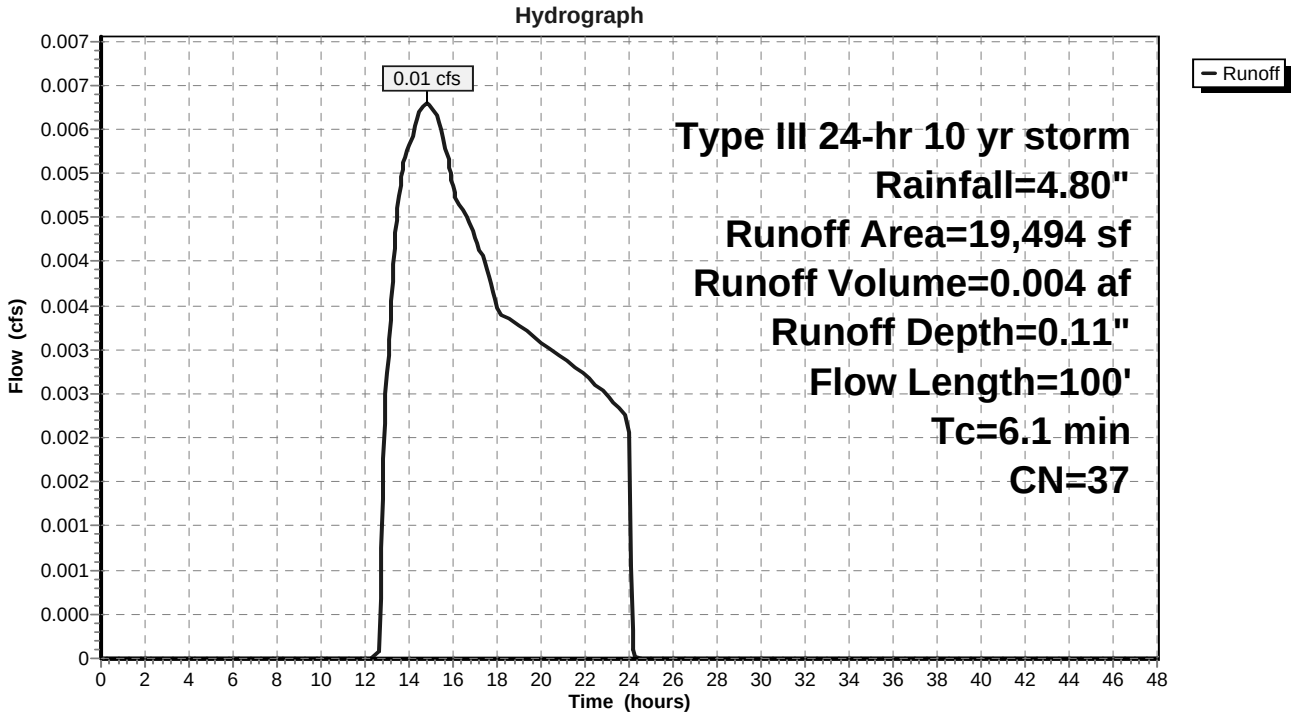
Runoff = 0.01 cfs @ 14.83 hrs, Volume= 0.004 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 2647 roof (sent to inf) |
| 9,587 | 39 | >75% Grass cover, Good, HSG A |
| 9,907 | 36 | Woods, Fair, HSG A |
| 19,494 | 37 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.6 | 50 | 0.0300 | 0.2 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 1.5 | 50 | 0.0130 | 0.6 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.1 | 100 | Total | | | |

## Subcatchment POST 1A:



## Subcatchment POST 1B:

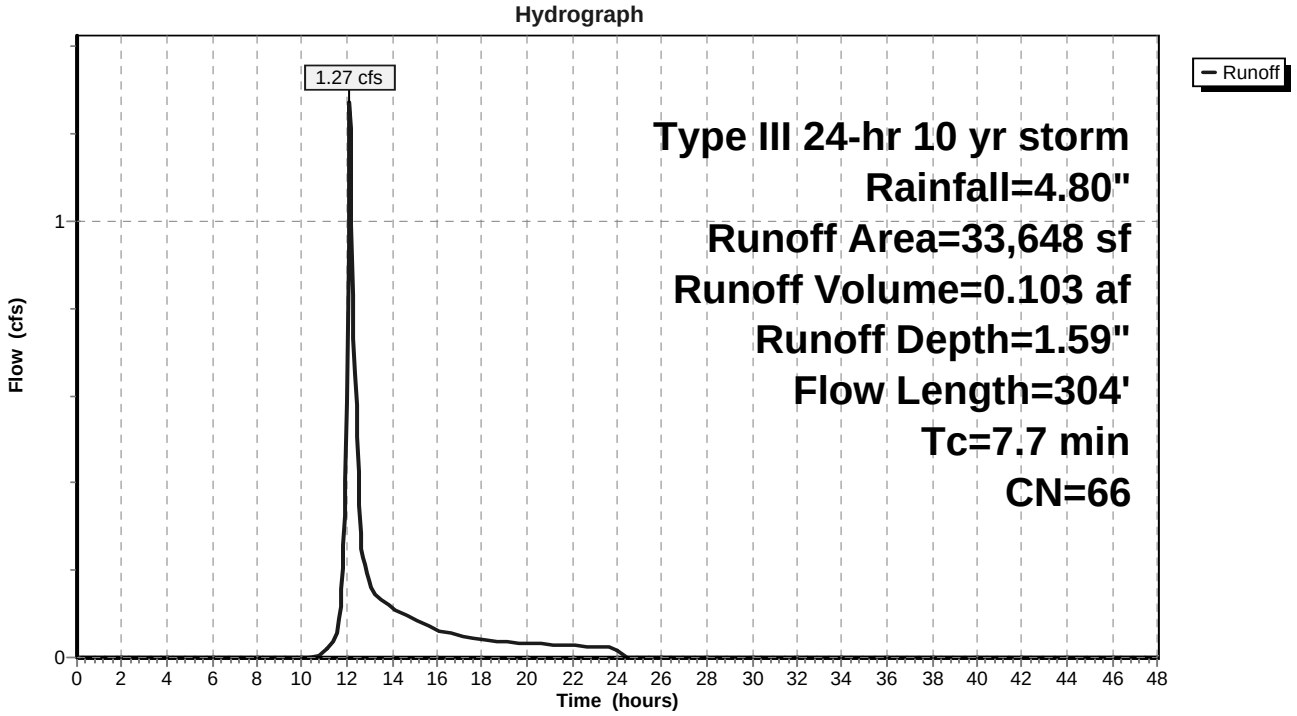
Runoff = 1.27 cfs @ 12.12 hrs, Volume= 0.103 af, Depth= 1.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 3360 SF roof (sent to infiltrator) |
| 10,507 | 98 | Paved roads w/curbs & sewers |
| 3,047 | 98 | Driveways |
| 1,784 | 98 | Basin |
| 18,310 | 39 | >75% Grass cover, Good, HSG A |
| 33,648 | 66 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.2 | 37 | 0.0080 | 0.1 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 0.9 | 131 | 0.0145 | 2.4 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 136 | 0.0080 | 4.1 | 3.19 | **Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 7.7 | 304 | Total | | | |

## Subcatchment POST 1B:



## Subcatchment POST 2A:

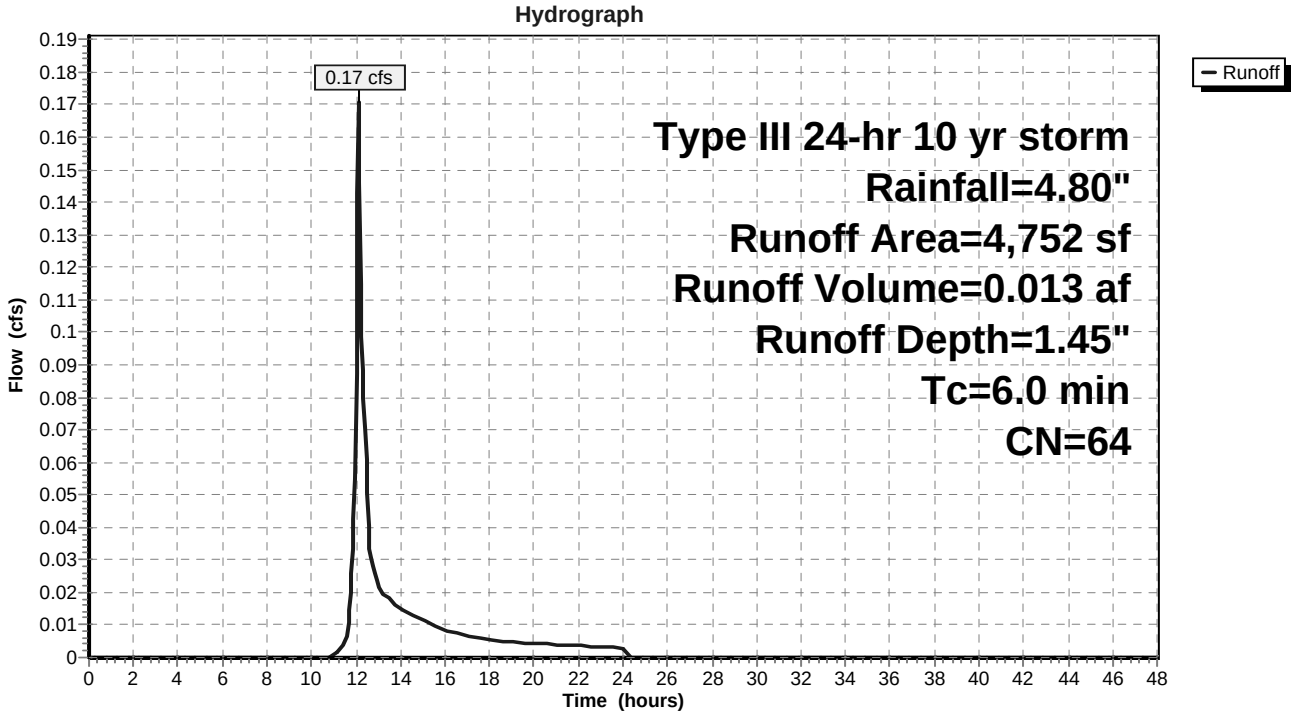
Runoff = 0.17 cfs @ 12.10 hrs, Volume= 0.013 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 2,021 | 98 | Paved roads w/curbs & sewers |
| 2,731 | 39 | >75% Grass cover, Good, HSG A |
| 4,752 | 64 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment POST 2A:



## Subcatchment POST 2B: POST-2B

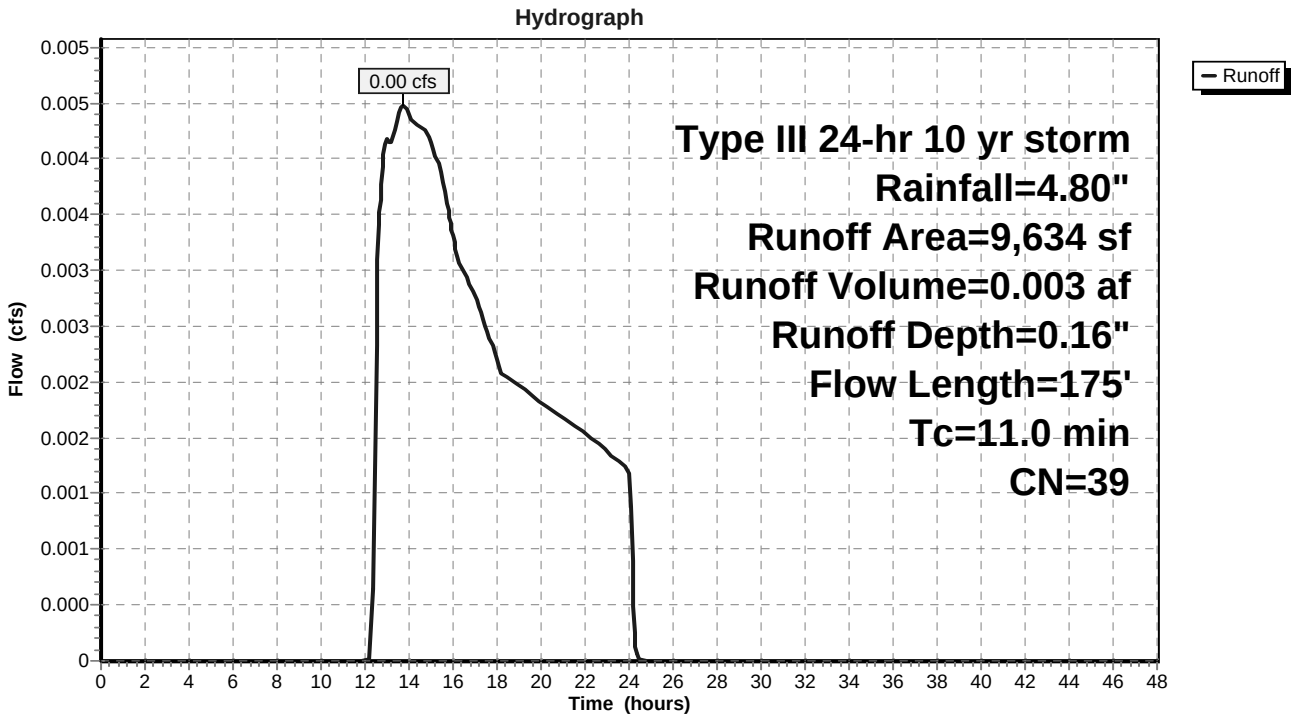
Runoff = 0.00 cfs @ 13.75 hrs, Volume= 0.003 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 2,481 SF Roofs (sent to infiltrator) |
| 9,634 | 39 | >75% Grass cover, Good, HSG A |
| 9,634 | 39 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0050 | 0.1 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 1.5 | 125 | 0.0400 | 1.4 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 11.0 | 175 | Total | | | |

## Subcatchment POST 2B: POST-2B



## Subcatchment POST 3:

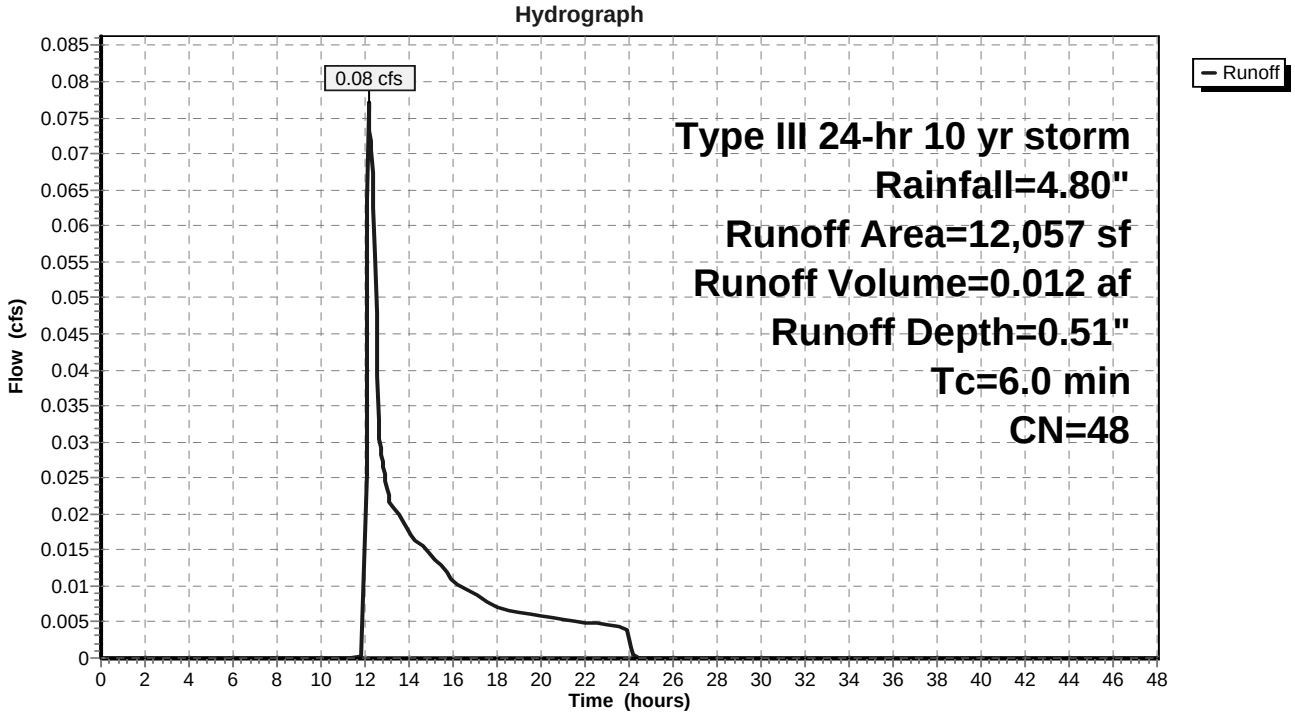
Runoff = 0.08 cfs @ 12.16 hrs, Volume= 0.012 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr storm Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 1,933 | 98 | PAVED AND SIDEWALK |
| 0 | 98 | 1176 ROOF INFILTRATED |
| 10,124 | 39 | >75% Grass cover, Good, HSG A |
| 12,057 | 48 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment POST 3:



## Pond 1P:

Inflow Area = 0.772 ac, Inflow Depth = 1.59" for 10 yr storm event
Inflow = 1.27 cfs @ 12.12 hrs, Volume= 0.103 af
Outflow = 0.36 cfs @ 12.54 hrs, Volume= 0.103 af, Atten= 72%, Lag= 25.4 min
Discarded = 0.36 cfs @ 12.54 hrs, Volume= 0.103 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 93.54' @ 12.54 hrs Surf.Area= 1,890 sf Storage= 941 cf
Plug-Flow detention time= 15.8 min calculated for 0.102 af (100% of inflow)
Center-of-Mass det. time= 15.8 min ( 878.0 - 862.2 )

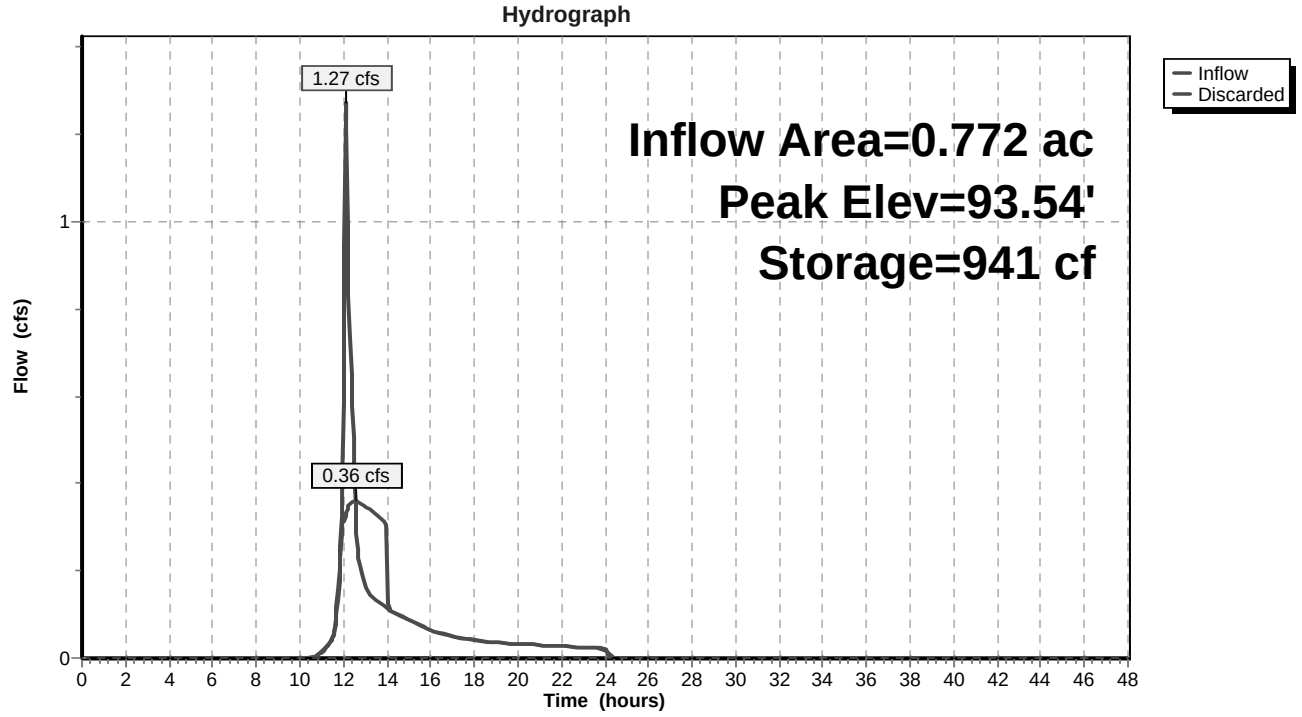
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 93.00' | 4,305 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 93.00 | 1,600 | 0 | 0 |
| 94.00 | 2,138 | 1,869 | 1,869 |
| 95.00 | 2,733 | 2,436 | 4,305 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 0.00' | **8.270 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.36 cfs @ 12.54 hrs HW=93.54' (Free Discharge)
**1=Exfiltration** (Exfiltration Controls 0.36 cfs)

## Pond 1P:



## Pond 2P:

Inflow Area = 0.109 ac, Inflow Depth = 1.45" for 10 yr storm event
Inflow = 0.17 cfs @ 12.10 hrs, Volume= 0.013 af
Outflow = 0.05 cfs @ 12.00 hrs, Volume= 0.013 af, Atten= 72%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.00 hrs, Volume= 0.013 af

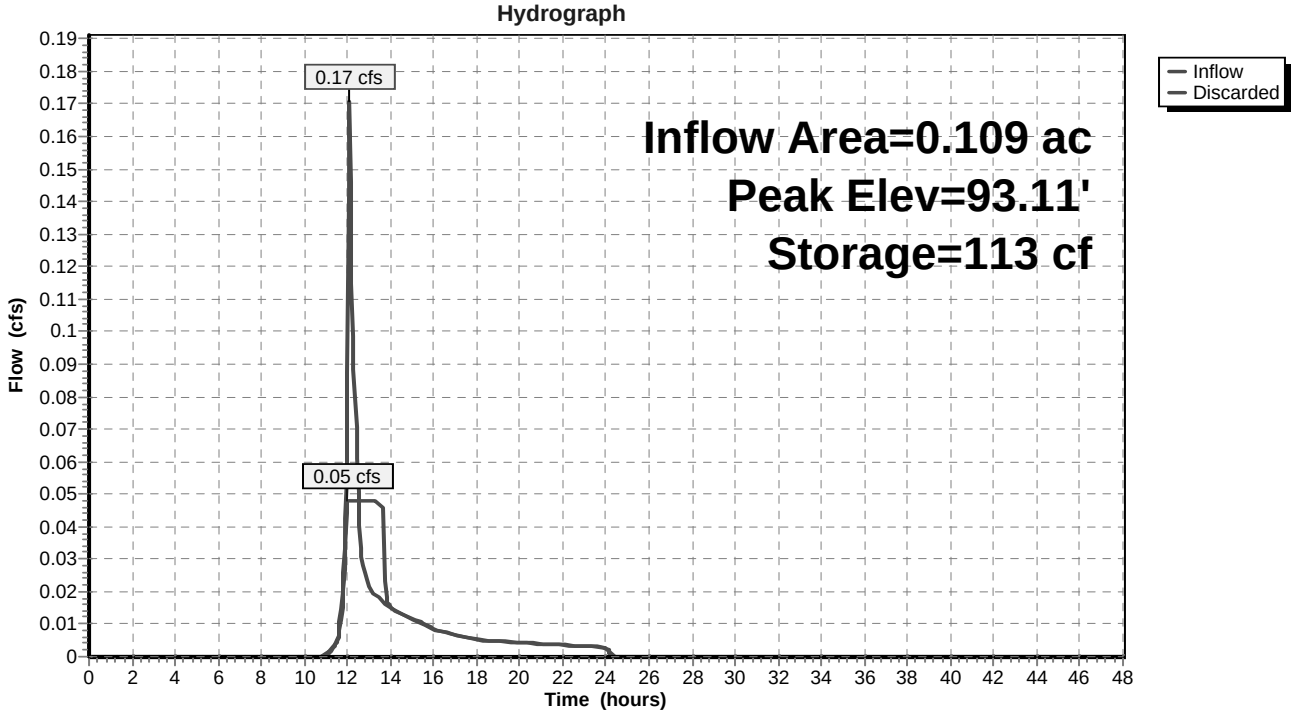
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 93.11' @ 12.51 hrs Surf.Area= 251 sf Storage= 113 cf
Plug-Flow detention time= 13.9 min calculated for 0.013 af (100% of inflow)
Center-of-Mass det. time= 13.9 min ( 880.2 - 866.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 92.50' | 226 cf | **8.00'D x 4.50'H Vertical Cone/Cylinder** x 5<br>1,131 cf Overall - 565 cf Embedded = 565 cf x 40.0% Voids |
| #2 | 92.50' | 565 cf | **6.00'D x 4.00'H Vertical Cone/Cylinder** x 5 Inside #1 |
| | | 792 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 0.00' | **8.270 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.05 cfs @ 12.00 hrs HW=92.57' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

## Pond 2P:



## Pond 3P:

Inflow Area = 0.277 ac, Inflow Depth = 0.51" for 10 yr storm event
Inflow = 0.08 cfs @ 12.16 hrs, Volume= 0.012 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 92.90' @ 24.40 hrs Surf.Area= 734 sf Storage= 517 cf
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

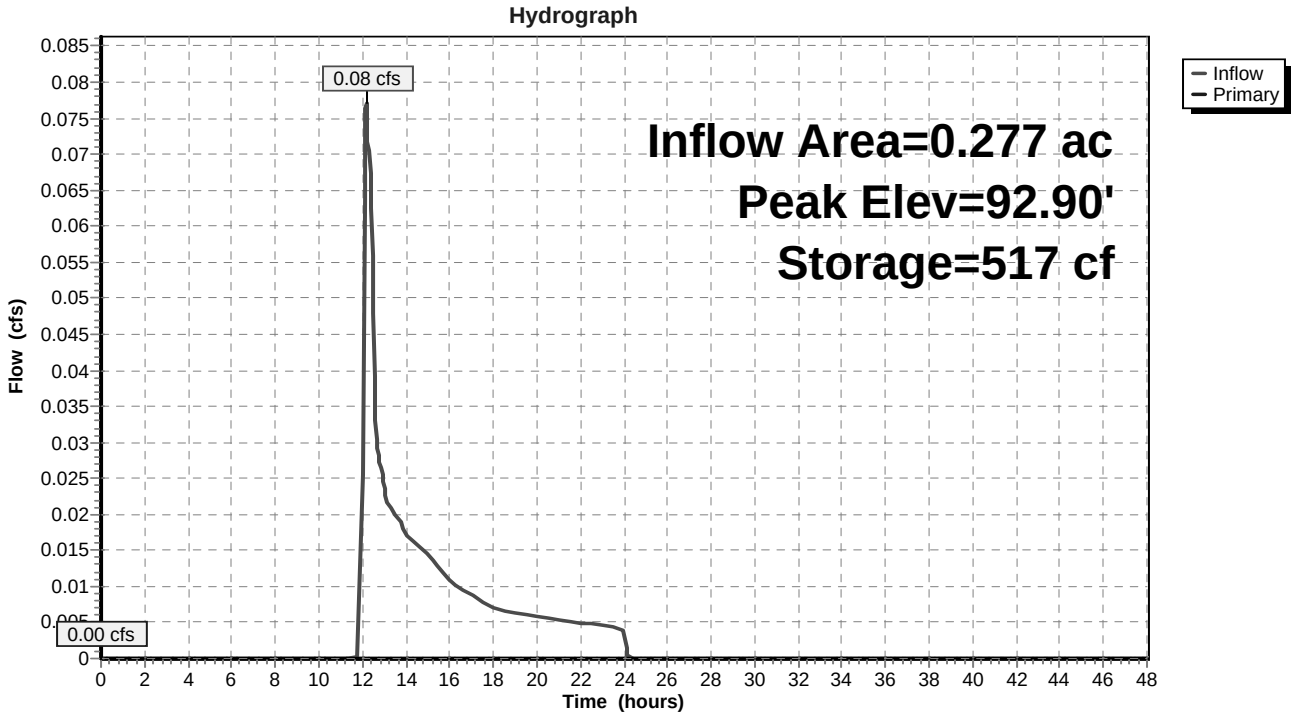
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 92.00' | 590 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 92.00 | 411 | 0 | 0 |
| 93.00 | 768 | 590 | 590 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 92.95' | **4.0' long x 4.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=92.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 3P:

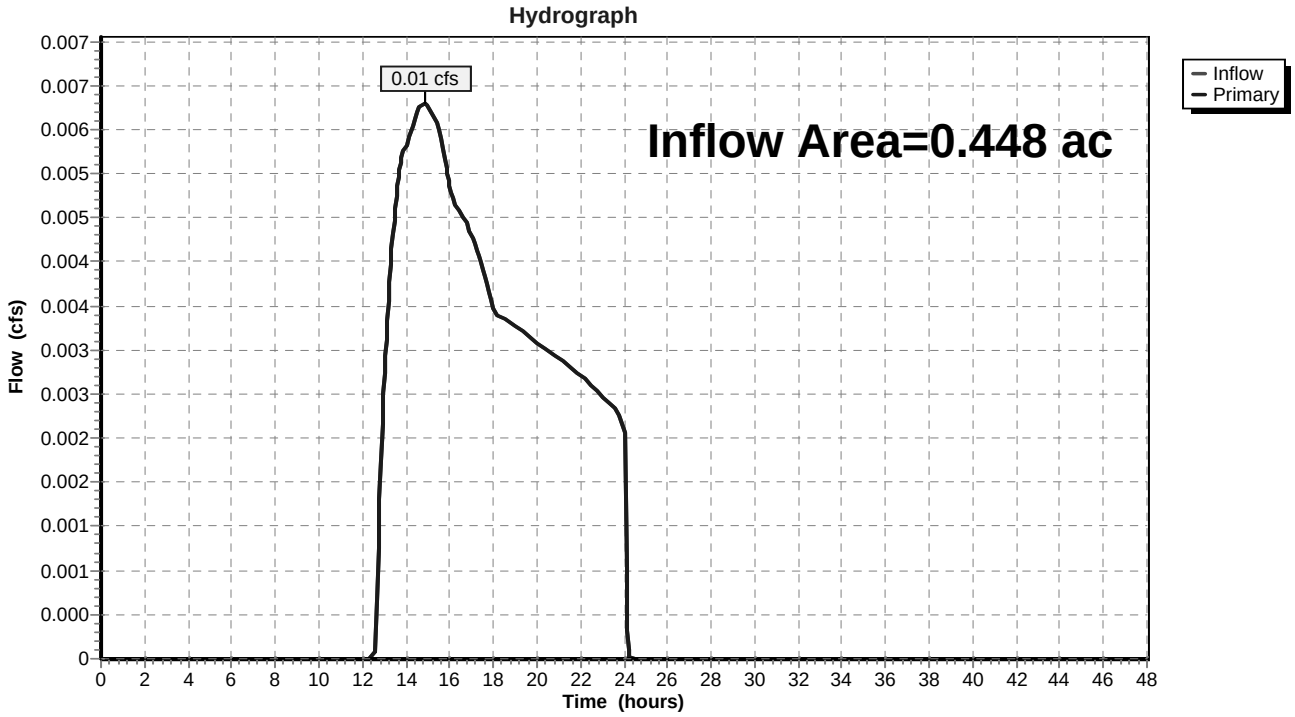

Hydrograph
Inflow Area=0.277 ac
Peak Elev=92.90'
Storage=517 cf
0.08 cfs
0.00 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0.085
0.08
0.075
0.07
0.065
0.06
0.055
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

## Pond SUM-1:

Inflow Area = 0.448 ac, Inflow Depth = 0.11" for 10 yr storm event
Inflow = 0.01 cfs @ 14.83 hrs, Volume= 0.004 af
Primary = 0.01 cfs @ 14.83 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

## Pond SUM-1:

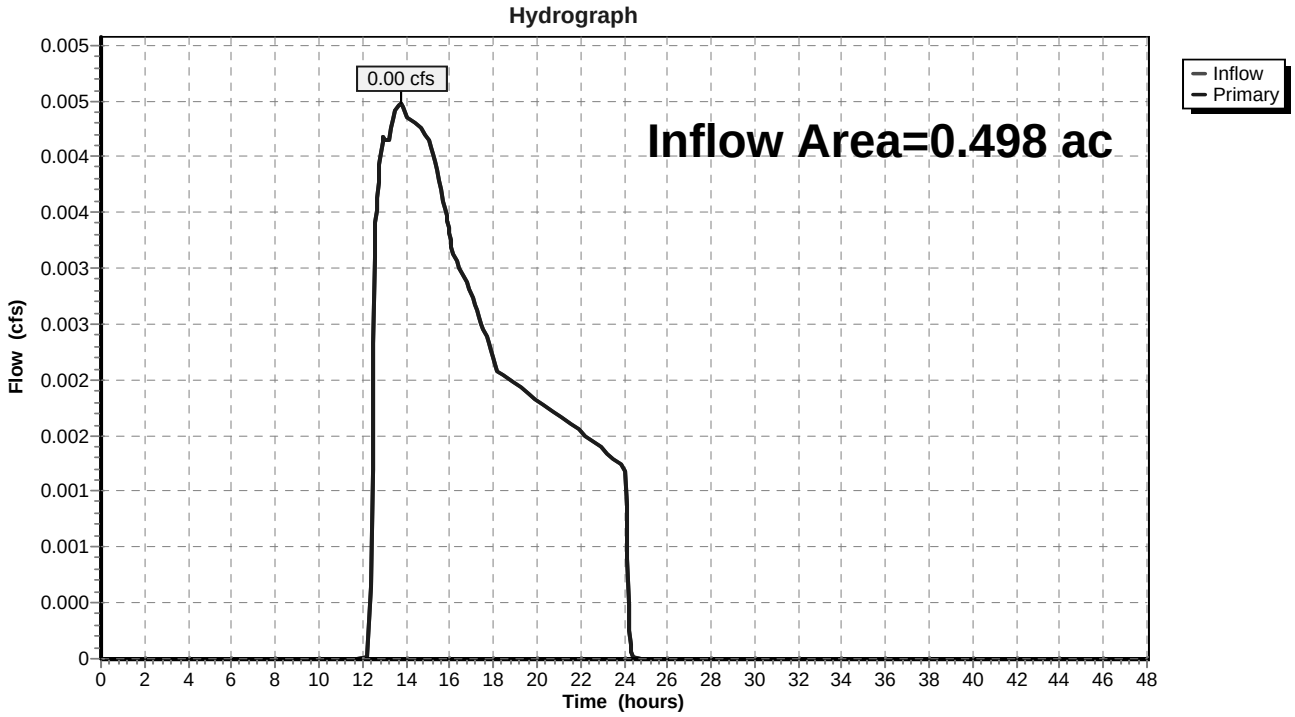


## Pond SUM-2:

Inflow Area = 0.498 ac, Inflow Depth = 0.07" for 10 yr storm event
Inflow = 0.00 cfs @ 13.75 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 13.75 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

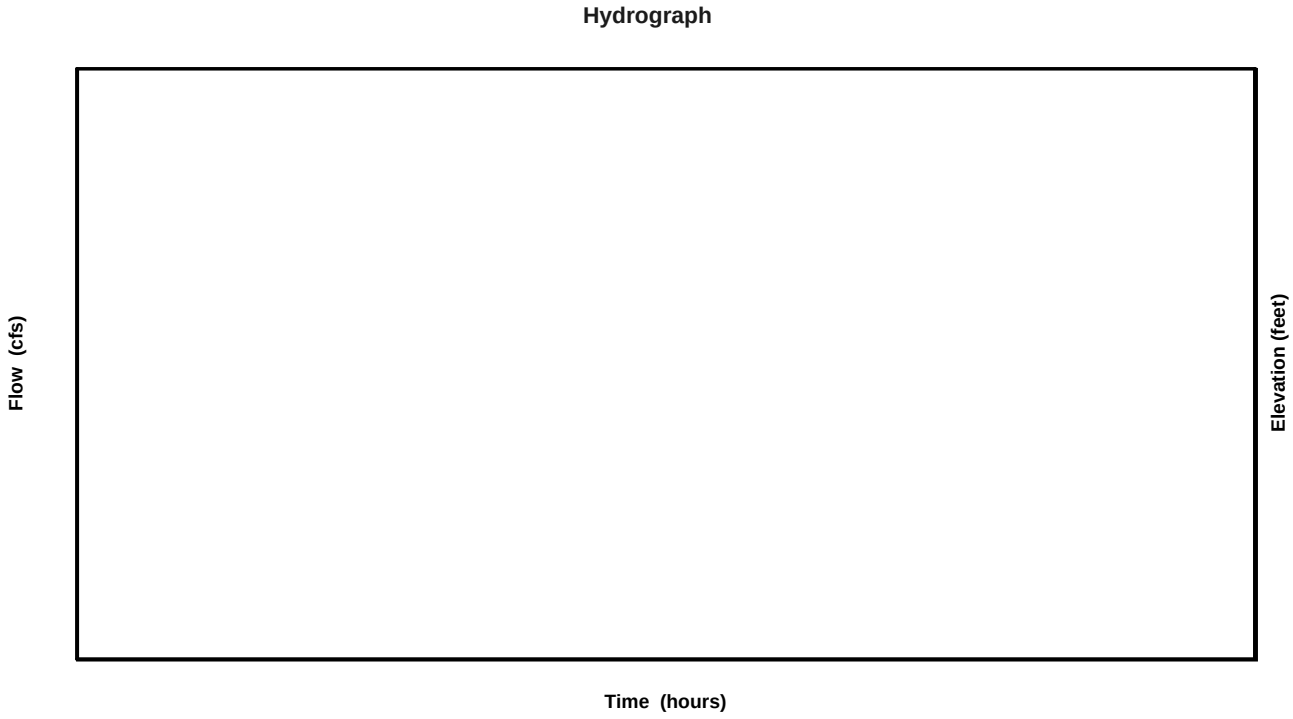
## Pond SUM-2:



## Pond SUM-3:

Routing by Stor-Ind method

## Pond SUM-3:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment POST 1A:** Runoff Area=19,494 sf Runoff Depth=0.63"
Flow Length=100' Tc=6.1 min CN=37 Runoff=0.13 cfs 0.023 af

**Subcatchment POST 1B:** Runoff Area=33,648 sf Runoff Depth=3.20"
Flow Length=304' Tc=7.7 min CN=66 Runoff=2.68 cfs 0.206 af

**Subcatchment POST 2A:** Runoff Area=4,752 sf Runoff Depth=3.00"
Tc=6.0 min CN=64 Runoff=0.37 cfs 0.027 af

**Subcatchment POST 2B: POST-2B** Runoff Area=9,634 sf Runoff Depth=0.77"
Flow Length=175' Tc=11.0 min CN=39 Runoff=0.08 cfs 0.014 af

**Subcatchment POST 3:** Runoff Area=12,057 sf Runoff Depth=1.49"
Tc=6.0 min CN=48 Runoff=0.40 cfs 0.034 af

**Pond 1P:** Peak Elev=94.43' Storage=2,833 cf Inflow=2.68 cfs 0.206 af
Outflow=0.46 cfs 0.206 af

**Pond 2P:** Peak Elev=94.61' Storage=391 cf Inflow=0.37 cfs 0.027 af
Outflow=0.05 cfs 0.027 af

**Pond 3P:** Peak Elev=92.99' Storage=581 cf Inflow=0.40 cfs 0.034 af
Outflow=0.07 cfs 0.022 af

**Pond SUM-1:** Inflow=0.13 cfs 0.023 af
Primary=0.13 cfs 0.023 af

**Pond SUM-2:** Inflow=0.11 cfs 0.036 af
Primary=0.11 cfs 0.036 af

**Pond SUM-3:**

**Total Runoff Area = 1.827 ac Runoff Volume = 0.305 af Average Runoff Depth = 2.01"**

## Subcatchment POST 1A:

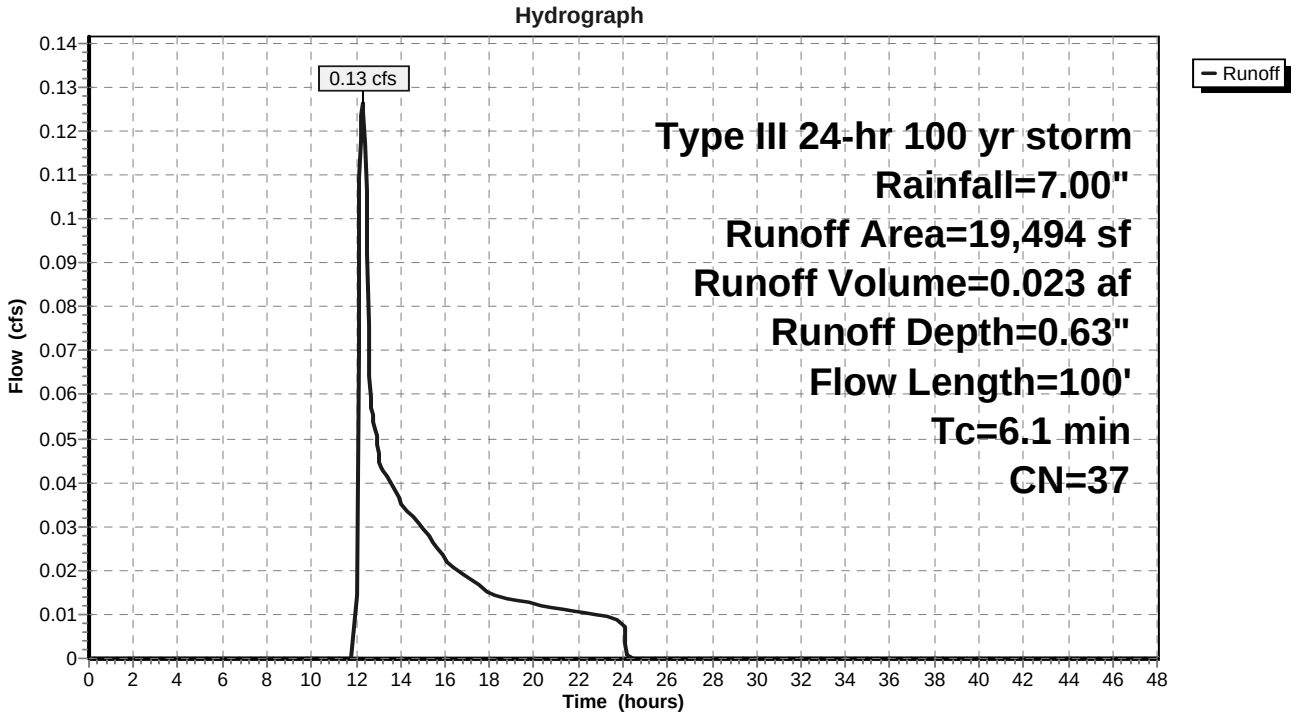
Runoff = 0.13 cfs @ 12.30 hrs, Volume= 0.023 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 2647 roof (sent to inf) |
| 9,587 | 39 | >75% Grass cover, Good, HSG A |
| 9,907 | 36 | Woods, Fair, HSG A |
| 19,494 | 37 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.6 | 50 | 0.0300 | 0.2 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 1.5 | 50 | 0.0130 | 0.6 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 6.1 | 100 | Total | | | |

## Subcatchment POST 1A:



## Subcatchment POST 1B:

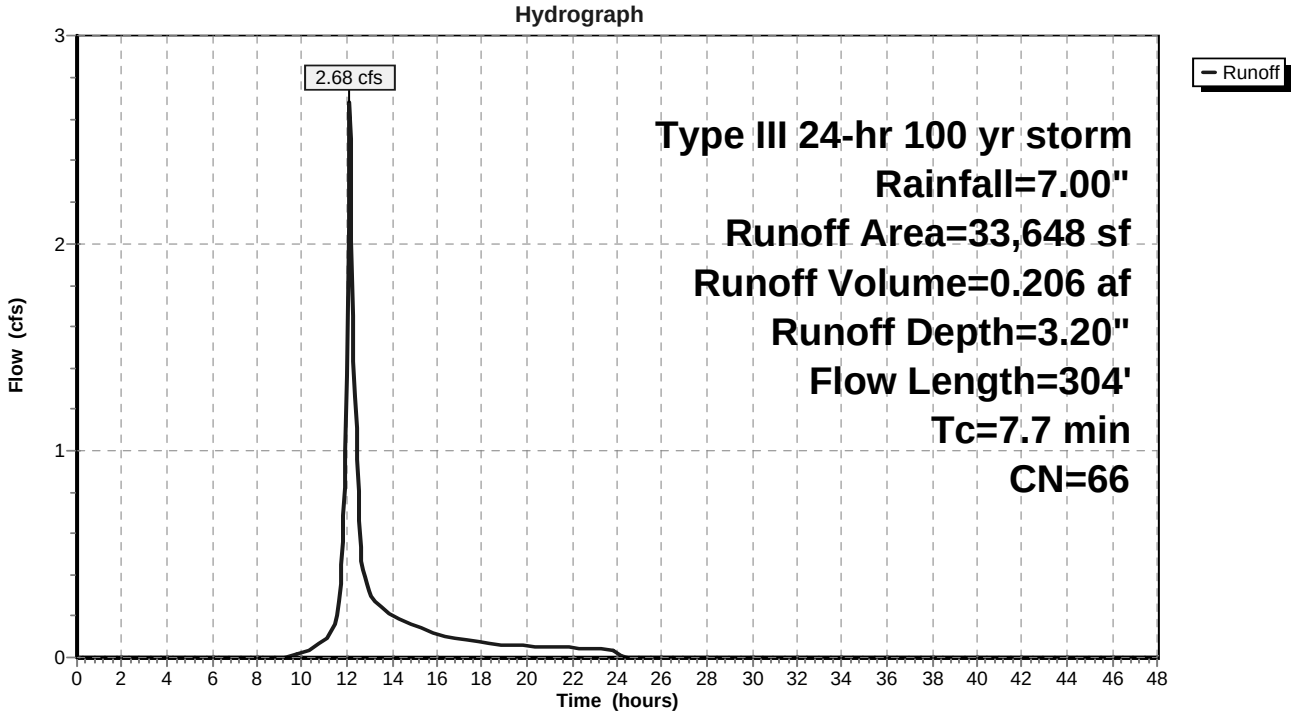
Runoff = 2.68 cfs @ 12.11 hrs, Volume= 0.206 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 3360 SF roof (sent to infiltrator) |
| 10,507 | 98 | Paved roads w/curbs & sewers |
| 3,047 | 98 | Driveways |
| 1,784 | 98 | Basin |
| 18,310 | 39 | >75% Grass cover, Good, HSG A |
| 33,648 | 66 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.2 | 37 | 0.0080 | 0.1 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 0.9 | 131 | 0.0145 | 2.4 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 0.6 | 136 | 0.0080 | 4.1 | 3.19 | **Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 |
| 7.7 | 304 | Total | | | |

## Subcatchment POST 1B:



## Subcatchment POST 2A:

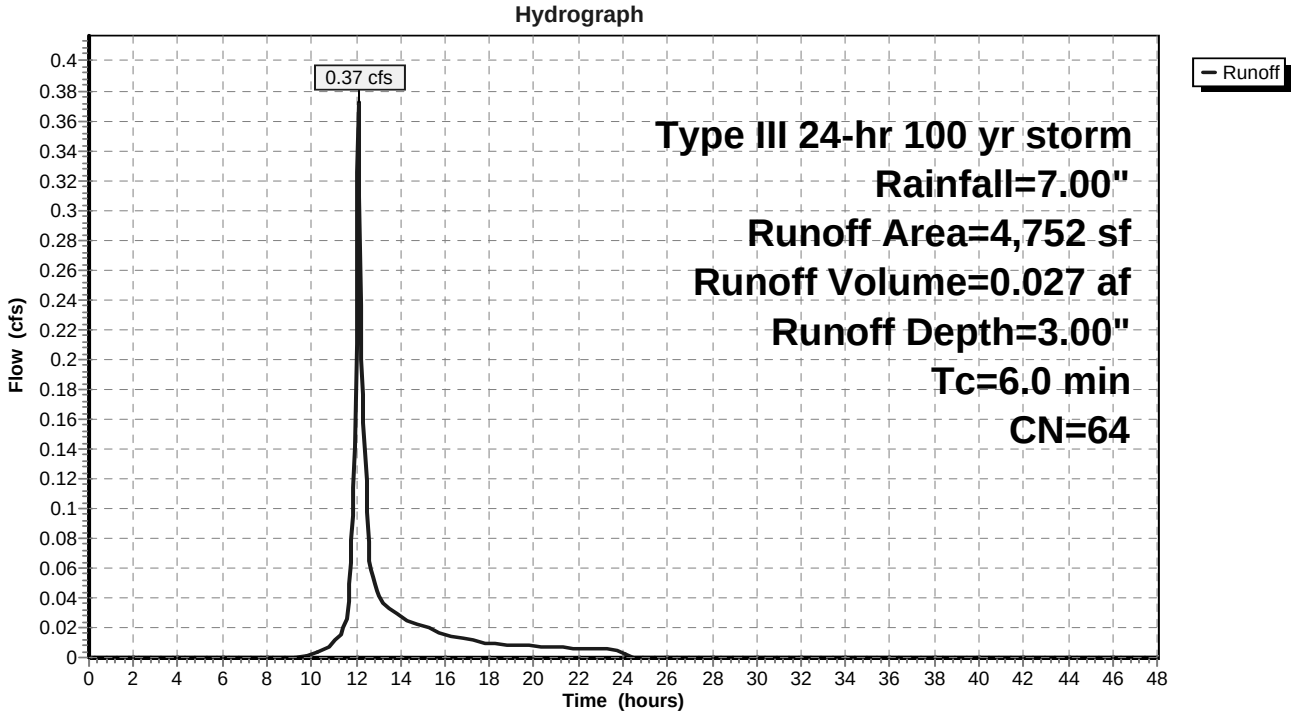
Runoff = 0.37 cfs @ 12.10 hrs, Volume= 0.027 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 2,021 | 98 | Paved roads w/curbs & sewers |
| 2,731 | 39 | >75% Grass cover, Good, HSG A |
| 4,752 | 64 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment POST 2A:



## Subcatchment POST 2B: POST-2B

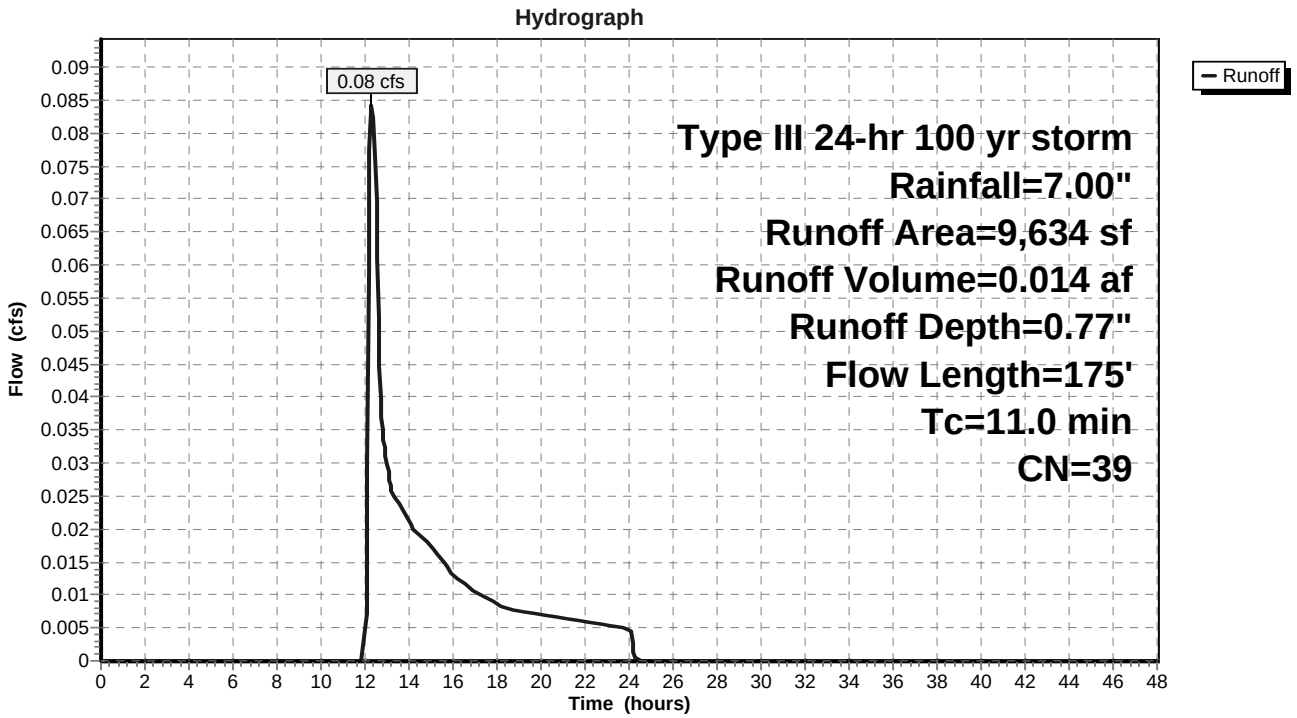
Runoff = 0.08 cfs @ 12.31 hrs, Volume= 0.014 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 0 | 98 | 2,481 SF Roofs (sent to infiltrator) |
| 9,634 | 39 | >75% Grass cover, Good, HSG A |
| 9,634 | 39 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0050 | 0.1 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.40" |
| 1.5 | 125 | 0.0400 | 1.4 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 11.0 | 175 | Total | | | |

## Subcatchment POST 2B: POST-2B



## Subcatchment POST 3:

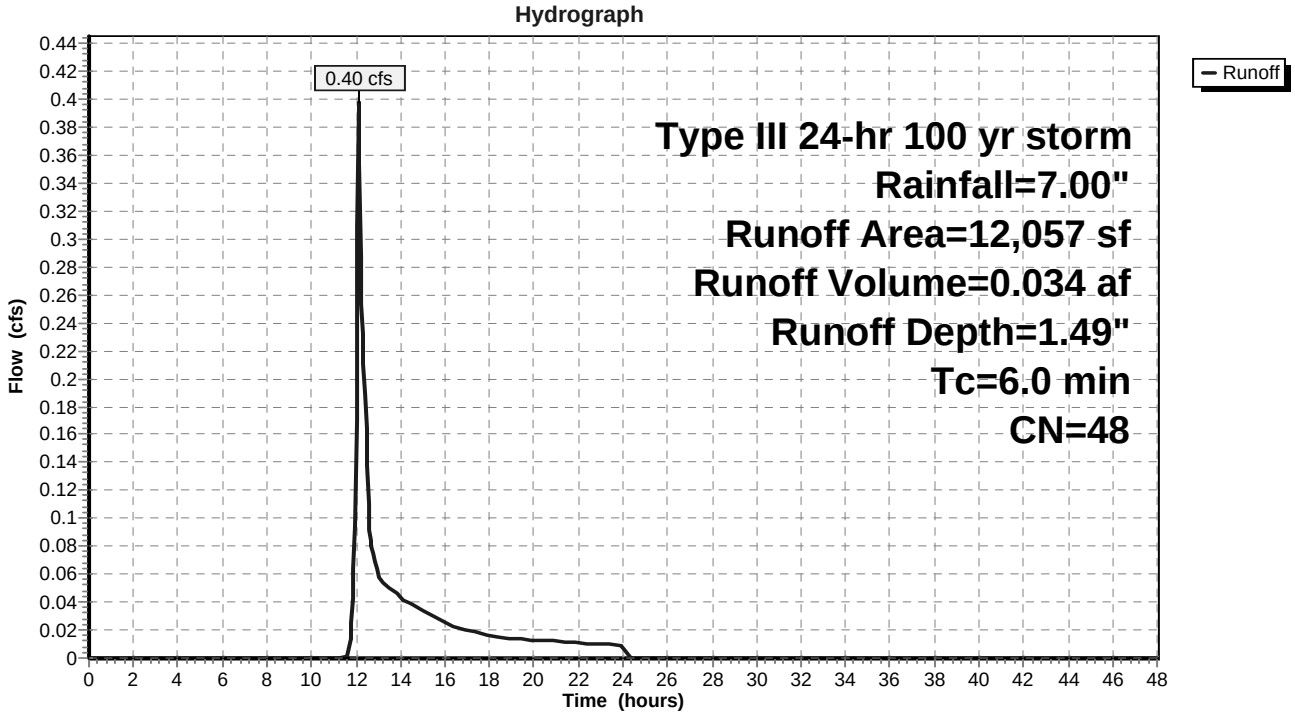
Runoff = 0.40 cfs @ 12.11 hrs, Volume= 0.034 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 1,933 | 98 | PAVED AND SIDEWALK |
| 0 | 98 | 1176 ROOF INFILTRATED |
| 10,124 | 39 | >75% Grass cover, Good, HSG A |
| 12,057 | 48 | Weighted Average |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment POST 3:



## Pond 1P:

Inflow Area = 0.772 ac, Inflow Depth = 3.20" for 100 yr storm event
Inflow = 2.68 cfs @ 12.11 hrs, Volume= 0.206 af
Outflow = 0.46 cfs @ 12.66 hrs, Volume= 0.206 af, Atten= 83%, Lag= 32.9 min
Discarded = 0.46 cfs @ 12.66 hrs, Volume= 0.206 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 94.43' @ 12.66 hrs Surf.Area= 2,391 sf Storage= 2,833 cf
Plug-Flow detention time= 50.3 min calculated for 0.206 af (100% of inflow)
Center-of-Mass det. time= 50.2 min ( 891.5 - 841.3 )

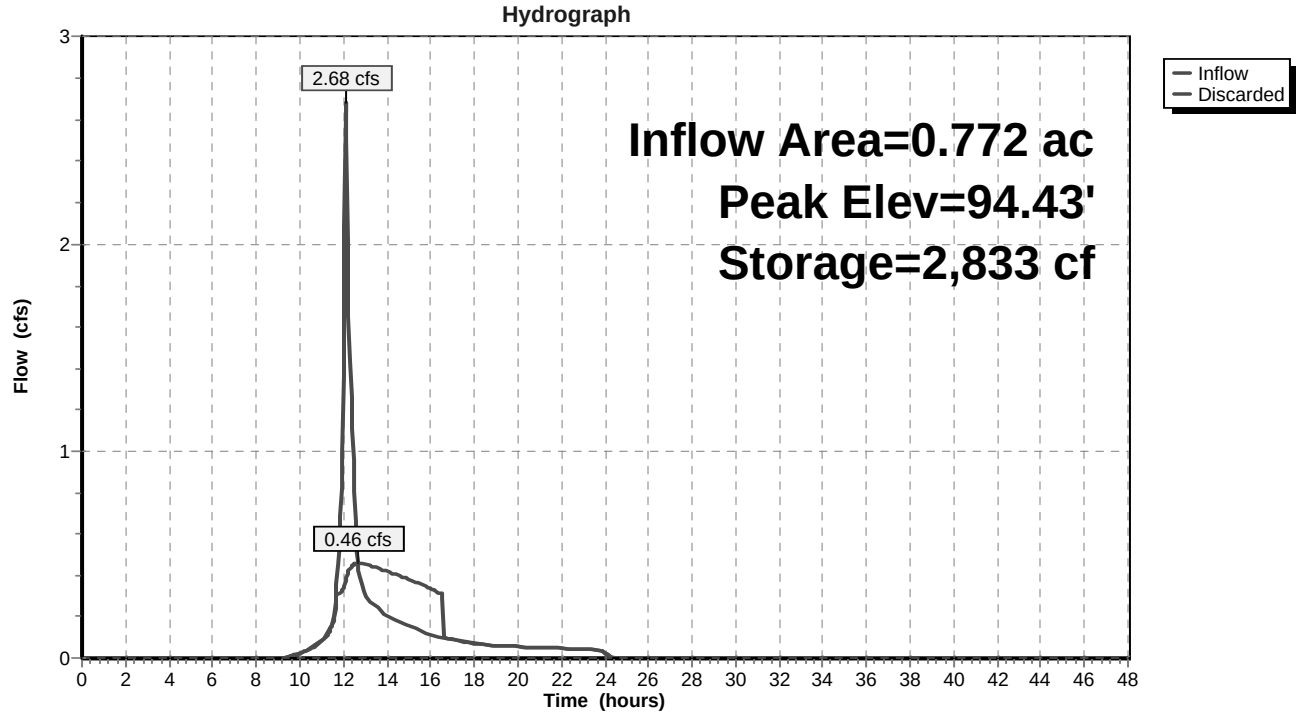
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 93.00' | 4,305 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 93.00 | 1,600 | 0 | 0 |
| 94.00 | 2,138 | 1,869 | 1,869 |
| 95.00 | 2,733 | 2,436 | 4,305 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 0.00' | **8.270 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.46 cfs @ 12.66 hrs HW=94.43' (Free Discharge)
**1=Exfiltration** (Exfiltration Controls 0.46 cfs)

## Pond 1P:



## Pond 2P:

Inflow Area = 0.109 ac, Inflow Depth = 3.00" for 100 yr storm event
Inflow = 0.37 cfs @ 12.10 hrs, Volume= 0.027 af
Outflow = 0.05 cfs @ 11.75 hrs, Volume= 0.027 af, Atten= 87%, Lag= 0.0 min
Discarded = 0.05 cfs @ 11.75 hrs, Volume= 0.027 af

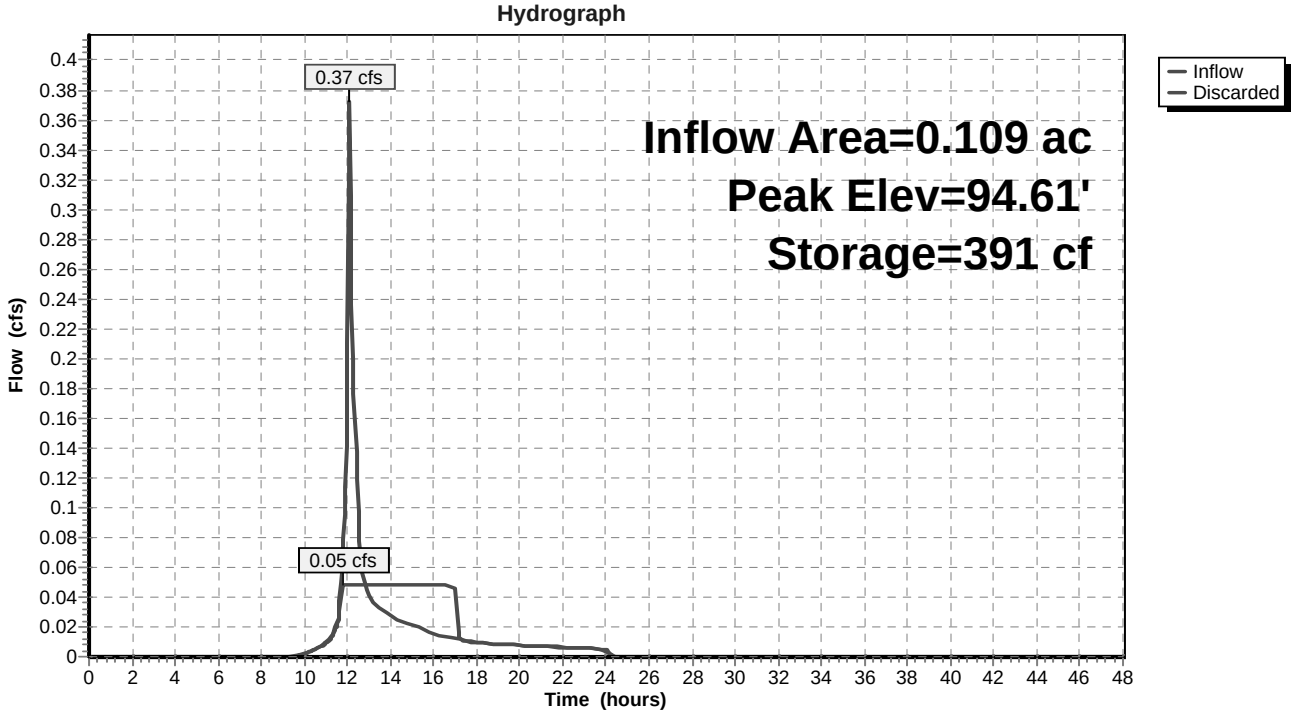
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 94.61' @ 12.85 hrs Surf.Area= 251 sf Storage= 391 cf
Plug-Flow detention time= 64.7 min calculated for 0.027 af (100% of inflow)
Center-of-Mass det. time= 64.7 min ( 908.9 - 844.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 92.50' | 226 cf | **8.00'D x 4.50'H Vertical Cone/Cylinder** x 5<br>1,131 cf Overall - 565 cf Embedded = 565 cf x 40.0% Voids |
| #2 | 92.50' | 565 cf | **6.00'D x 4.00'H Vertical Cone/Cylinder** x 5 Inside #1 |
| | | 792 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 0.00' | **8.270 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.05 cfs @ 11.75 hrs HW=92.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

## Pond 2P:



## Pond 3P:

Inflow Area = 0.277 ac, Inflow Depth = 1.49" for 100 yr storm event
Inflow = 0.40 cfs @ 12.11 hrs, Volume= 0.034 af
Outflow = 0.07 cfs @ 12.85 hrs, Volume= 0.022 af, Atten= 82%, Lag= 44.2 min
Primary = 0.07 cfs @ 12.85 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 92.99' @ 12.85 hrs Surf.Area= 764 sf Storage= 581 cf
Plug-Flow detention time= 223.6 min calculated for 0.022 af (63% of inflow)
Center-of-Mass det. time= 99.8 min ( 987.3 - 887.5 )

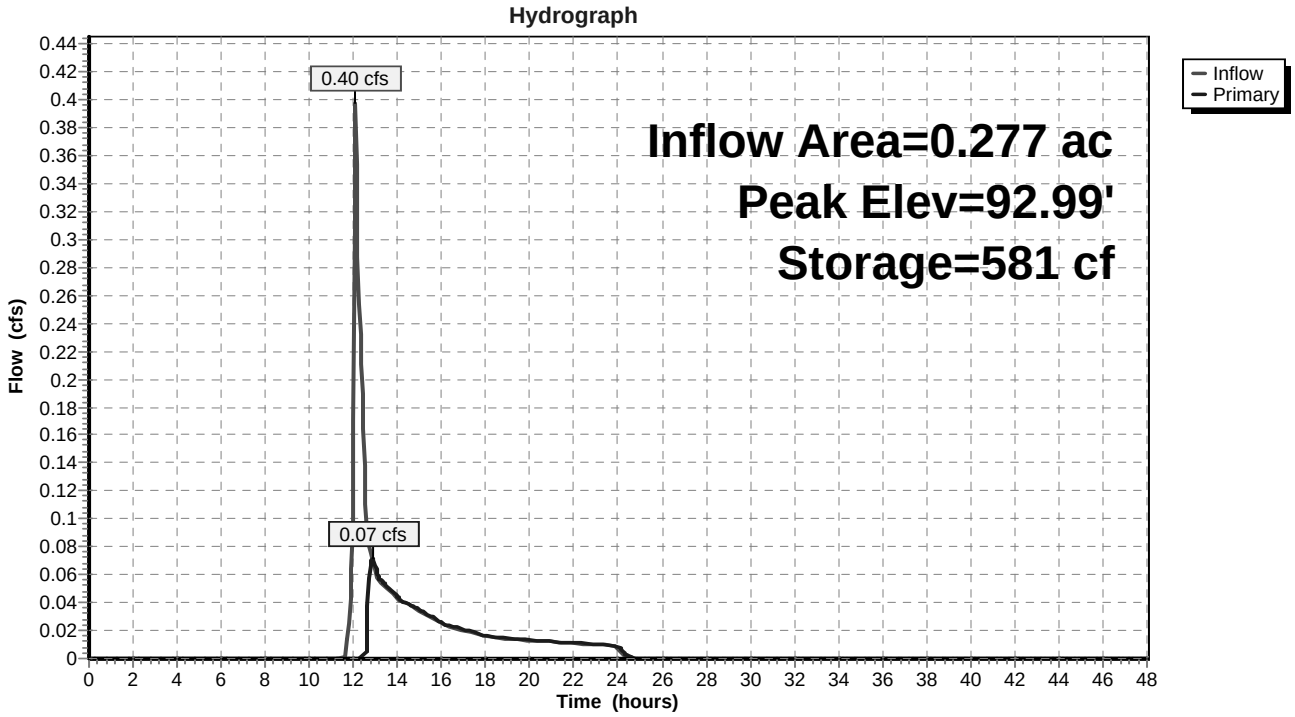
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 92.00' | 590 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 92.00 | 411 | 0 | 0 |
| 93.00 | 768 | 590 | 590 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 92.95' | **4.0' long x 4.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |

**Primary OutFlow** Max=0.07 cfs @ 12.85 hrs HW=92.99' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.5 fps)

## Pond 3P:

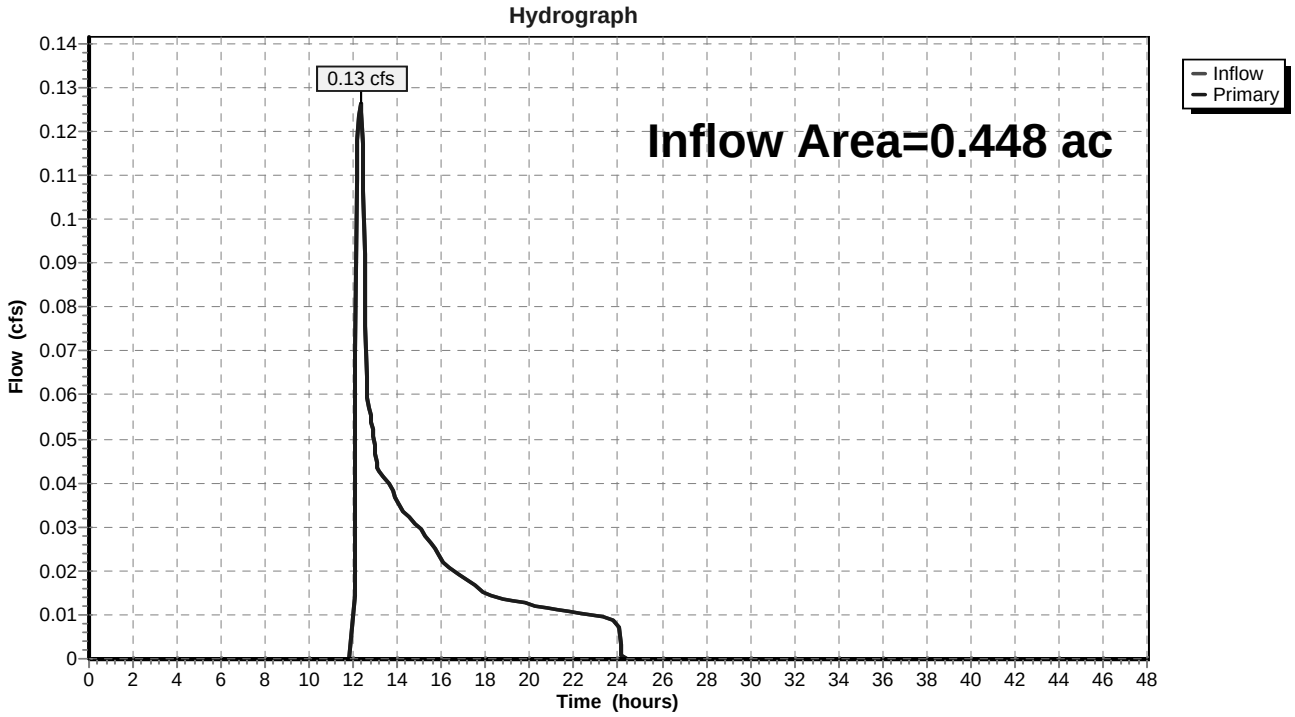

Hydrograph
Inflow
Primary
0.40 cfs
0.07 cfs
Inflow Area=0.277 ac
Peak Elev=92.99'
Storage=581 cf
Flow (cfs)
Time (hours)
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28 0.3 0.32 0.34 0.36 0.38 0.4 0.42 0.44
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

## Pond SUM-1:

Inflow Area = 0.448 ac, Inflow Depth = 0.63" for 100 yr storm event
Inflow = 0.13 cfs @ 12.30 hrs, Volume= 0.023 af
Primary = 0.13 cfs @ 12.30 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

## Pond SUM-1:

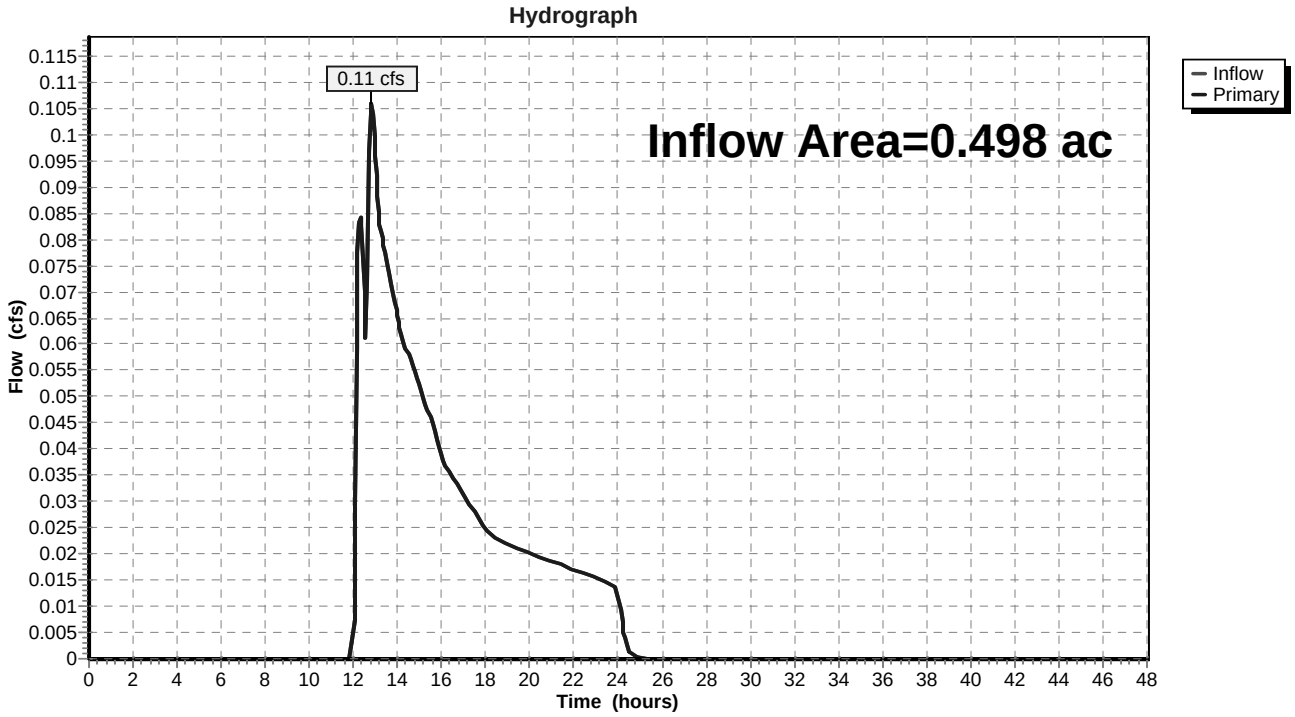


## Pond SUM-2:

Inflow Area = 0.498 ac, Inflow Depth = 0.87" for 100 yr storm event
Inflow = 0.11 cfs @ 12.81 hrs, Volume= 0.036 af
Primary = 0.11 cfs @ 12.81 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

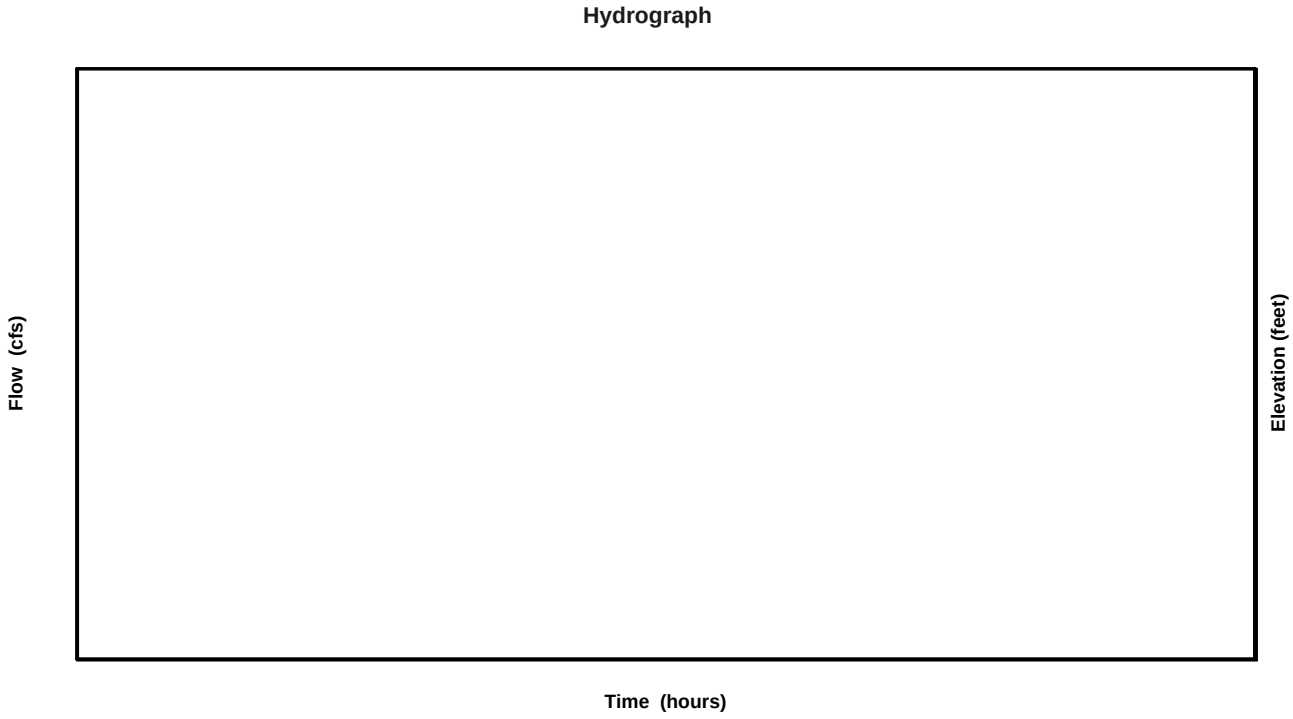
## Pond SUM-2:



## Pond SUM-3:

Routing by Stor-Ind method

## Pond SUM-3:



**Attachment A-1**

**Summaries and Calculations**

PRIME ENGINEERING INC

PROJECT:
SHEET NO. OF
CALC'D BY: CHECKED BY:
DATE:

## STANDARD 3: RECHARGE VOLUME

USE HYDROLOGIC GROUP "A"
- REQUIRES 0.6" x IMPERVIOUS AREA

IMPERVIOUS AREA = 26,700 S.F.

REQ'D RECHARGE = $(26{,}700\ ft^2) \times (0.6\ in)\left(\frac{ft}{12\ in}\right) = 1{,}335\ cf$

RECHARGE PROVIDED:

| | | |
|---|---|---|
| RETENTION BASIN | : | 2,900 cf |
| LEACHING PITS | : | 454 cf |
| ROOF INFILTRATORS | : | 6 x 2 x 63.4 = 760 cf |
| TOTAL | : | 4,014 cf. |

CHECK: 4,014 cf provided > 1,335 cf. req'd

OK

## STANDARD 4: WATER QUALITY VOLUME (WQV)

STEP 1 (FROM MASS DEP Q Rate - SEPT 10, 2013)

USE "1-INCH RULE" (1-INCH x IMPERVIOUS AREA)

| DEVICE | IMP. AREA (SF) | x 1-INCH | WQV (C.F) |
|---|---|---|---|
| STC-1 / BASIN | 14,000 | 1/12 | 1,167 |
| STC-2 / PITS | 2,100 | 1/12 | 175 |
| STC-3 | 1,800 | 1/12 | 150 |

PRIME ENGINEERING INC

PROJECT:
SHEET NO. OF
CALC'D BY: CHECKED BY:
DATE:

STEP 8: Time of concentration ($t_c$)

| | $t_c$ (min) | |
|---|---|---|
| STC-1 | 7.7 | (0.128 h) |
| STC-2 | 5 | (0.083 h) |
| STC-3 | 5 | (0.083 h) |

STEP 9: See Figure 3/4 or Guidance

STEP 10: Determine $q_u$

$q_u$ (cfs/mi²/in or csm/in)

| | |
|---|---|
| STC-1 | 736 |
| STC-2 | 795 |
| STC-3 | 795 |

STEP 11: Compute WQF ($Q_1$)

$$Q_1 = (q_u)(A)(WQV)$$

| Device | $q_u$ (csm/in) | A (SF) | Convert $mi^2$ to $ft^2$ | WQV (in) | $Q_1$ |
|---|---|---|---|---|---|
| STC-1 | 736 | 14,000 | $\frac{1\ mi^2}{27878400}$ | 1" | 0.370 cfs |
| STC-2 | 795 | 2,100 | $\frac{1}{27878400}$ | 1" | 0.06 cfs |
| STC-3 | 795 | 1,800 | $\frac{1}{27878400}$ | 1" | 0.05 cfs |

Check units

$$\left(\frac{cfs}{mi^2 \cdot in}\right)(ft^2)\left(\frac{1\ mi^2}{27878400\ ft^2}\right)(in) = cfs \checkmark$$

SIZE FOREBAY OF BASIN

$V = 0.1'' \times$ IMP AREA $= (14{,}000\ s.f.)(0.1'')\left(\frac{ft}{12''}\right) = 116$ CF

VOLUME PROVIDED = 400 C.F. OK

**Attachment A-2**

**Stormceptor Sizing Calculations**

Stormceptor®

# Stormceptor Design Summary

**PCSWMM for Stormceptor**

## Project Information

| | |
|---|---|
| Date | 1/6/2014 |
| Project Name | Ava's Way |
| Project Number | N/A |
| Location | STC-1 |

## Designer Information

| | |
|---|---|
| Company | PRIME ENGINEERING |
| Contact | EVAN WATSON |

## Notes

N/A

## Drainage Area

| | |
|---|---|
| Total Area (ac) | 0.86 |
| Imperviousness (%) | 40 |

The Stormceptor System model STC 450i achieves the water quality objective removing 86% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.37 cfs.

## Rainfall

| | |
|---|---|
| Name | HYANNIS |
| State | MA |
| ID | 3821 |
| Years of Records | 1984 to 1997 |
| Latitude | 41°24'0"N |
| Longitude | 70°10'47"W |

## Water Quality Objective

| | |
|---|---|
| TSS Removal (%) | 80 |
| WQ Flow Rate (cfs) | 0.37 |

## Upstream Storage

| Storage (ac-ft) | Discharge (cfs) |
|---|---|
| 0 | 0 |

## Stormceptor Sizing Summary

| Stormceptor Model | TSS Removal % |
|---|---|
| **STC 450i** | **86** |
| STC 900 | 91 |
| STC 1200 | 91 |
| STC 1800 | 91 |
| STC 2400 | 94 |
| STC 3600 | 94 |
| STC 4800 | 95 |
| STC 6000 | 96 |
| STC 7200 | 97 |
| STC 11000 | 98 |
| STC 13000 | 98 |
| STC 16000 | 98 |



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Stormceptor®

## Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

| Particle Size µm | Distribution % | Specific Gravity | Settling Velocity ft/s | | Particle Size µm | Distribution % | Specific Gravity | Settling Velocity ft/s |
|---|---|---|---|---|---|---|---|---|
| 20 | 20 | 1.3 | 0.0013 | | | | | |
| 60 | 20 | 1.8 | 0.0051 | | | | | |
| 150 | 20 | 2.2 | 0.0354 | | | | | |
| 400 | 20 | 2.65 | 0.2123 | | | | | |
| 2000 | 20 | 2.65 | 0.9417 | | | | | |

## Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

**Inlet and Outlet Pipe Invert Elevations Differences**

| Inlet Pipe Configuration | STC 450i | STC 900 to STC 7200 | STC 11000 to STC 16000 |
|---|---|---|---|
| Single inlet pipe | 3 in. | 1 in. | 3 in. |
| Multiple inlet pipes | 3 in. | 3 in. | Only one inlet pipe. |

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com



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# Stormceptor Design Summary

**PCSWMM for Stormceptor**

## Project Information

| | |
|---|---|
| Date | 1/6/2014 |
| Project Name | Ava's Way |
| Project Number | N/A |
| Location | STC-2 |

## Designer Information

| | |
|---|---|
| Company | PRIME ENGINEERING |
| Contact | EVAN WATSON |

## Notes

N/A

## Drainage Area

| | |
|---|---|
| Total Area (ac) | 0.11 |
| Imperviousness (%) | 43 |

The Stormceptor System model STC 450i achieves the water quality objective removing 96% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.06 cfs.

## Rainfall

| | |
|---|---|
| Name | HYANNIS |
| State | MA |
| ID | 3821 |
| Years of Records | 1984 to 1997 |
| Latitude | 41°24'0"N |
| Longitude | 70°10'47"W |

## Water Quality Objective

| | |
|---|---|
| TSS Removal (%) | 80 |
| WQ Flow Rate (cfs) | 0.06 |

## Upstream Storage

| Storage (ac-ft) | Discharge (cfs) |
|---|---|
| 0 | 0 |

## Stormceptor Sizing Summary

| Stormceptor Model | TSS Removal % |
|---|---|
| **STC 450i** | **96** |
| STC 900 | 98 |
| STC 1200 | 98 |
| STC 1800 | 98 |
| STC 2400 | 99 |
| STC 3600 | 99 |
| STC 4800 | 99 |
| STC 6000 | 99 |
| STC 7200 | 99 |
| STC 11000 | 100 |
| STC 13000 | 100 |
| STC 16000 | 100 |



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## Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

| Particle Size µm | Distribution % | Specific Gravity | Settling Velocity ft/s | | Particle Size µm | Distribution % | Specific Gravity | Settling Velocity ft/s |
|---|---|---|---|---|---|---|---|---|
| 20 | 20 | 1.3 | 0.0013 | | | | | |
| 60 | 20 | 1.8 | 0.0051 | | | | | |
| 150 | 20 | 2.2 | 0.0354 | | | | | |
| 400 | 20 | 2.65 | 0.2123 | | | | | |
| 2000 | 20 | 2.65 | 0.9417 | | | | | |

## Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

**Inlet and Outlet Pipe Invert Elevations Differences**

| Inlet Pipe Configuration | STC 450i | STC 900 to STC 7200 | STC 11000 to STC 16000 |
|---|---|---|---|
| Single inlet pipe | 3 in. | 1 in. | 3 in. |
| Multiple inlet pipes | 3 in. | 3 in. | Only one inlet pipe. |

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
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Rinker MATERIALS™

Stormceptor®

# Stormceptor Design Summary

**PCSWMM for Stormceptor**

## Project Information

| | |
|---|---|
| Date | 1/6/2014 |
| Project Name | Ava's Way |
| Project Number | N/A |
| Location | STC-3 |

## Designer Information

| | |
|---|---|
| Company | PRIME ENGINEERING |
| Contact | EVAN WATSON |

## Notes

N/A

## Drainage Area

| | |
|---|---|
| Total Area (ac) | 0.06 |
| Imperviousness (%) | 70 |

The Stormceptor System model STC 450i achieves the water quality objective removing 96% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.05 cfs.

## Rainfall

| | |
|---|---|
| Name | HYANNIS |
| State | MA |
| ID | 3821 |
| Years of Records | 1984 to 1997 |
| Latitude | 41°24'0"N |
| Longitude | 70°10'47"W |

## Water Quality Objective

| | |
|---|---|
| TSS Removal (%) | 80 |
| WQ Flow Rate (cfs) | 0.05 |

## Upstream Storage

| Storage (ac-ft) | Discharge (cfs) |
|---|---|
| 0 | 0 |

## Stormceptor Sizing Summary

| Stormceptor Model | TSS Removal % |
|---|---|
| **STC 450i** | **96** |
| STC 900 | 98 |
| STC 1200 | 98 |
| STC 1800 | 98 |
| STC 2400 | 99 |
| STC 3600 | 99 |
| STC 4800 | 99 |
| STC 6000 | 99 |
| STC 7200 | 99 |
| STC 11000 | 100 |
| STC 13000 | 100 |
| STC 16000 | 100 |



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## Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

| Particle Size µm | Distribution % | Specific Gravity | Settling Velocity ft/s | | Particle Size µm | Distribution % | Specific Gravity | Settling Velocity ft/s |
|---|---|---|---|---|---|---|---|---|
| 20 | 20 | 1.3 | 0.0013 | | | | | |
| 60 | 20 | 1.8 | 0.0051 | | | | | |
| 150 | 20 | 2.2 | 0.0354 | | | | | |
| 400 | 20 | 2.65 | 0.2123 | | | | | |
| 2000 | 20 | 2.65 | 0.9417 | | | | | |

## Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

**Inlet and Outlet Pipe Invert Elevations Differences**

| Inlet Pipe Configuration | STC 450i | STC 900 to STC 7200 | STC 11000 to STC 16000 |
|---|---|---|---|
| Single inlet pipe | 3 in. | 1 in. | 3 in. |
| Multiple inlet pipes | 3 in. | 3 in. | Only one inlet pipe. |

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
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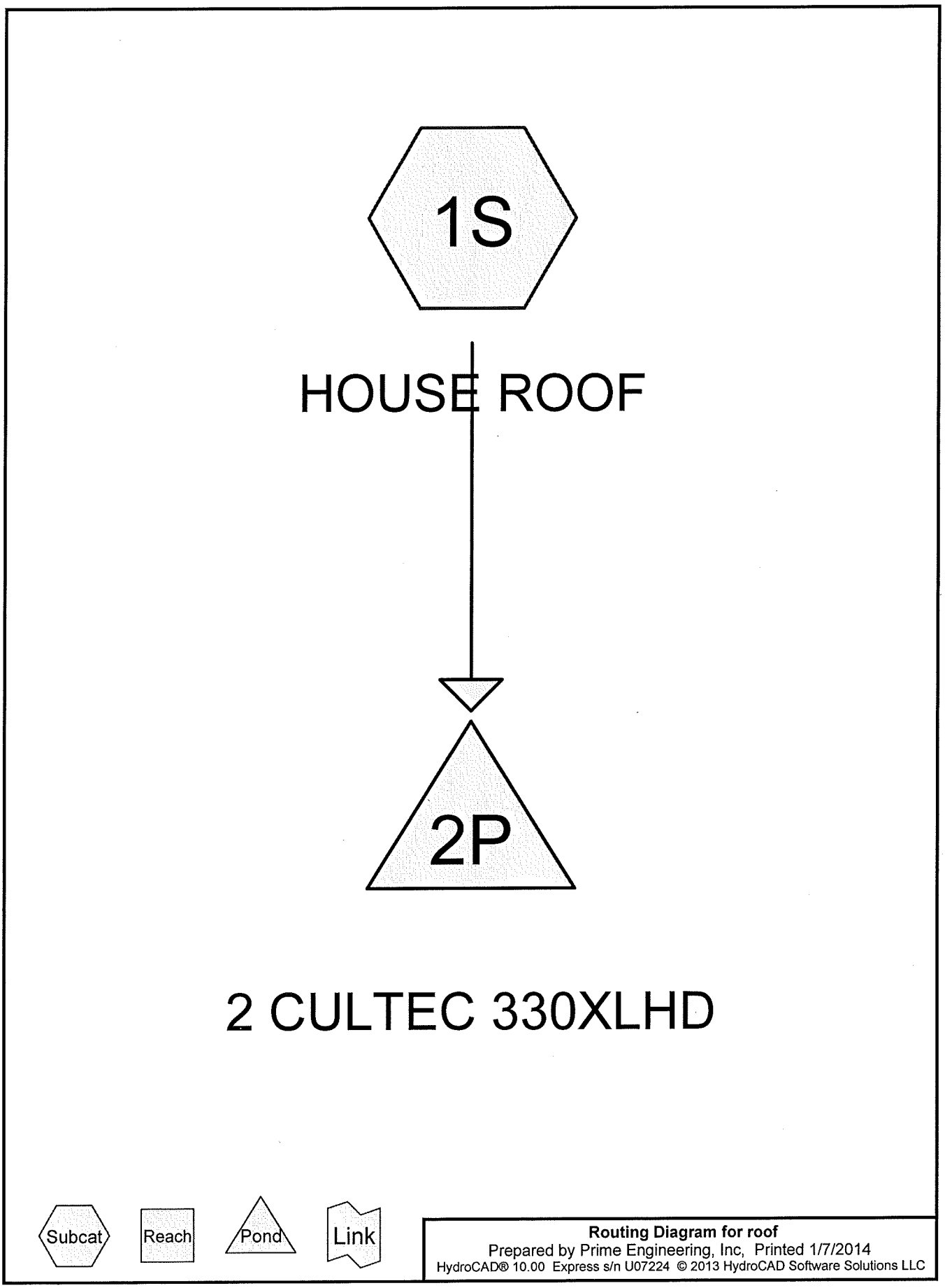
**Attachment A-3**

**Infiltrator Sizing Calculations**


1S
HOUSE ROOF
2P
2 CULTEC 330XLHD
Subcat
Reach
Pond
Link
Routing Diagram for roof
Prepared by Prime Engineering, Inc, Printed 1/7/2014
HydroCAD® 10.00 Express s/n U07224 © 2013 HydroCAD Software Solutions LLC

## Summary for Subcatchment 1S: HOUSE ROOF

[49] Hint: Tc<2dt may require smaller dt

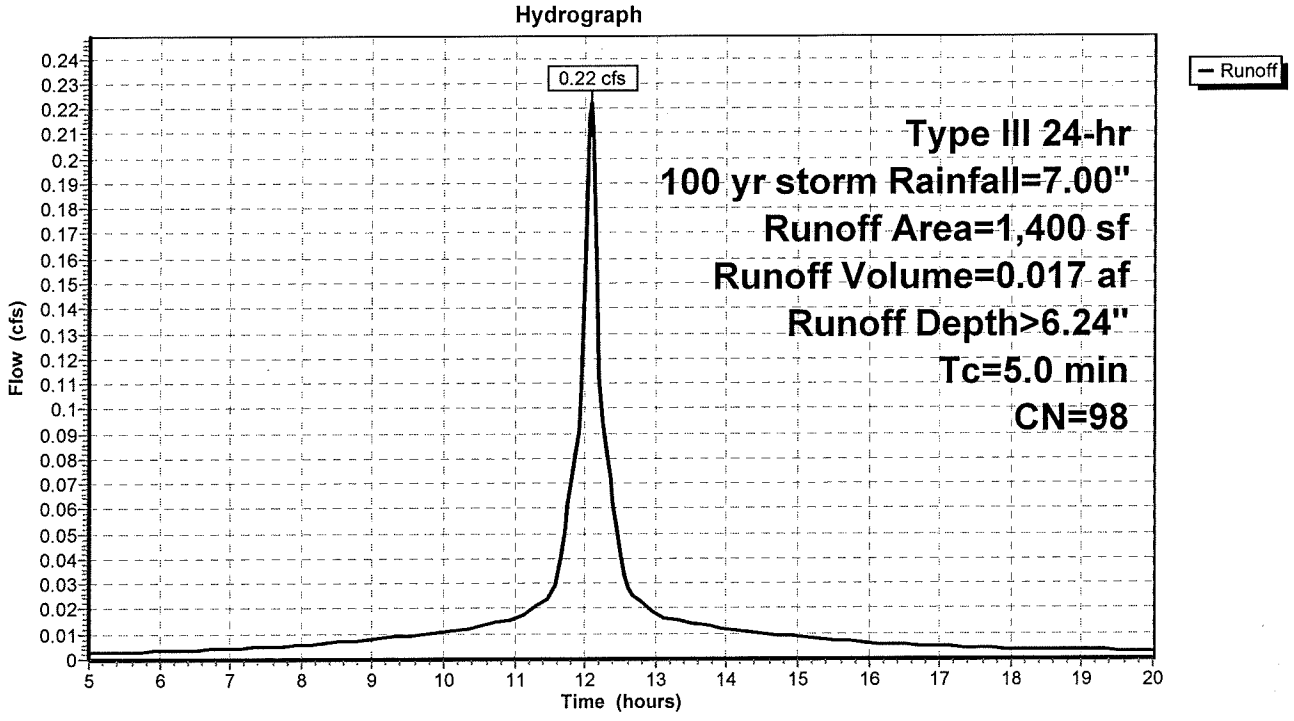
Runoff = 0.22 cfs @ 12.07 hrs, Volume= 0.017 af, Depth> 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr storm Rainfall=7.00"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 1,400 | 98 | |
| | 1,400 | | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 5.0 | | | | | **Direct Entry,** |

## Subcatchment 1S: HOUSE ROOF



## Summary for Pond 2P: 2 CULTEC 330XLHD

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.032 ac,100.00% Impervious, Inflow Depth > 6.24" for 100 yr storm event
Inflow = 0.22 cfs @ 12.07 hrs, Volume= 0.017 af
Outflow = 0.02 cfs @ 11.50 hrs, Volume= 0.017 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.02 cfs @ 11.50 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 96.75' @ 12.70 hrs Surf.Area= 0.003 ac Storage= 0.006 af

Plug-Flow detention time= 66.7 min calculated for 0.017 af (100% of inflow)
Center-of-Mass det. time= 66.2 min ( 799.0 - 732.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 93.50' | 0.003 af | **11.67'W x 11.00'L x 3.29'H Field A**<br>0.010 af Overall - 0.003 af Embedded = 0.007 af x 40.0% Voids |
| #2A | 94.00' | 0.003 af | **Cultec R-330XLHD** x 2 Inside #1<br>Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf<br>Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap<br>Row Length Adjustment= +1.50' x 7.45 sf x 2 rows |
| | | 0.006 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 93.50' | **8.270 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.02 cfs @ 11.50 hrs HW=93.53' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

## Pond 2P: 2 CULTEC 330XLHD - Chamber Wizard Field A

**Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)**
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

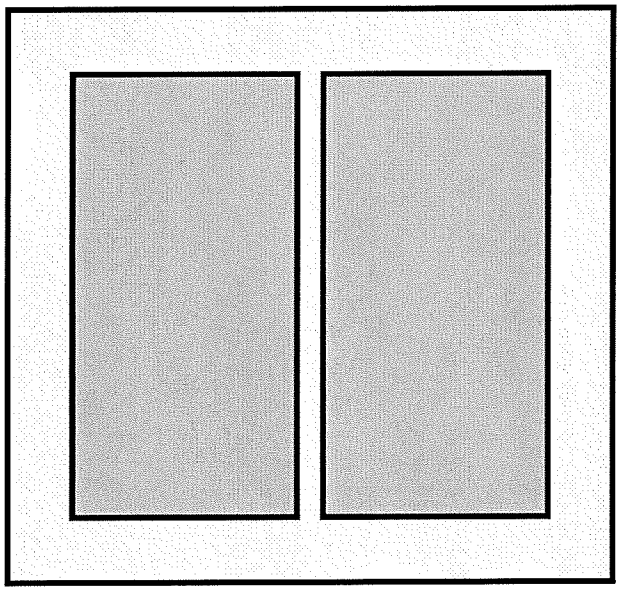
1 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 8.50' Row Length +15.0" End Stone x 2 = 11.00' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 15.0" Side Stone x 2 = 11.67' Base Width
6.0" Base + 30.5" Chamber Height + 3.0" Cover = 3.29' Field Height

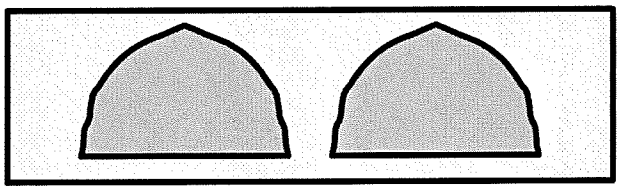
2 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 126.7 cf Chamber Storage

422.4 cf Field - 126.7 cf Chambers = 295.8 cf Stone x 40.0% Voids = 118.3 cf Stone Storage

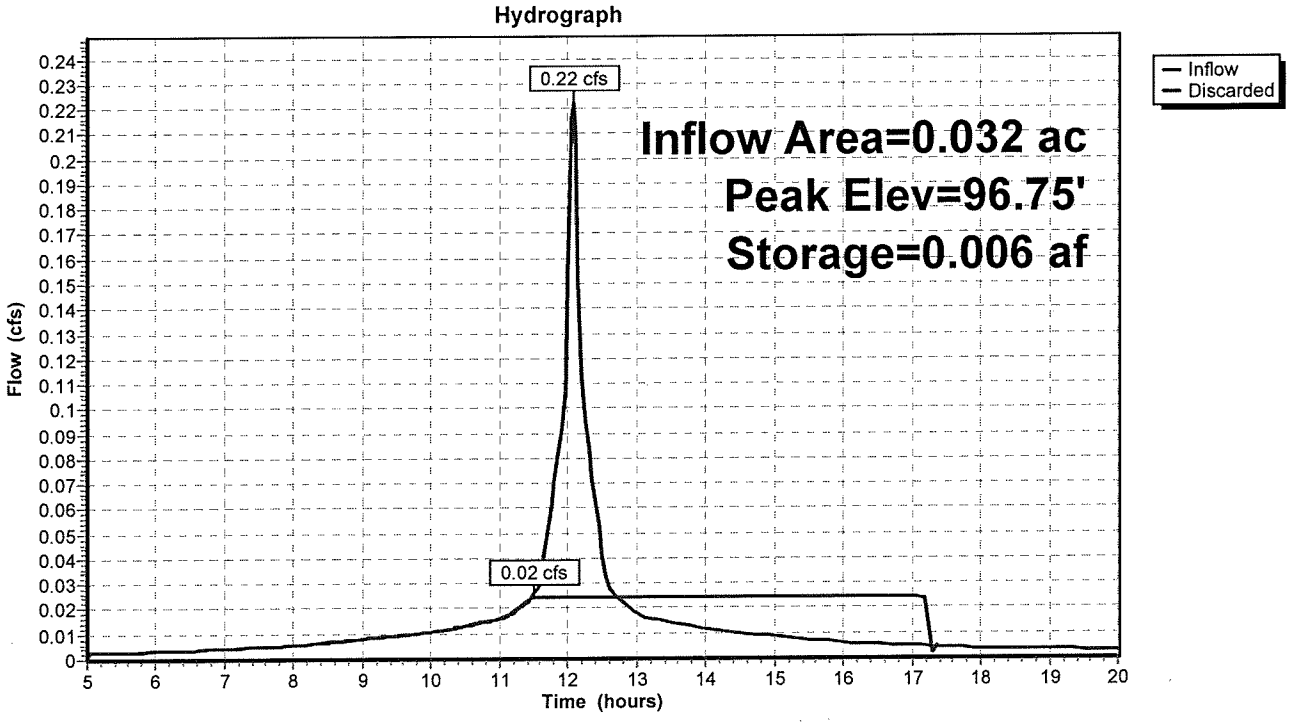
Chamber Storage + Stone Storage = 245.0 cf = 0.006 af
Overall Storage Efficiency = 58.0%

2 Chambers
15.6 cy Field
11.0 cy Stone





## Pond 2P: 2 CULTEC 330XLHD



**Attachment A-4**

**Mounding Calculations**

PRIME ENGINEERING INC

PROJECT:
SHEET NO. OF
CALC'D BY: CHECKED BY:
DATE:

MOUNDING ANALYSIS: EXPLANATION OF INPUTS

USE DIMENSIONS OF ft & hours

Hydraulic Conductivity (K)

- USED INFILTRATION RATE OF 8.27 in/hr, CONVERTED TO 0.6892 ft/hr

RECHARGE RATE (W)

- This mounding analysis calculates the mound beneath the basin to ensure it is drained after 72 hours. It assumes a constant infiltration rate over a set period of time. As shown on the hydrograph, the infiltration rate is not constant since the area of the basin increases with elevation. However, the infiltration rate will always be the same as K. To estimate a constant flow rate, an average area was used (L = 64, W = 28; L x W = 64 x 28 = 1792 sf.

Check rate:

$$\left(0.6892 \frac{ft}{hr}\right)(64ft)(28\,ft)\left(\frac{hr}{3600\,sec}\right) = 0.34\,cfs$$

0.34 cfs is about the average inf. rate during the storm and greater than the average for the 14 hours used in the calculation

**APPENDIX B**

# EROSION AND SEDIMENTATION CONTROL PROCEDURES

# CONTROLS

## Erosion and Sediment Controls

Soil erosion is the process by which the surface of the land is worn away by the action of wind, water, ice, and gravity. Natural or geologic erosion is a factor in creating the topographic features of the earth as we know it today. Except for some cases of shoreline and stream channel erosion, natural erosion occurs at a very slow and uniform rate. Accelerated erosion occurs when the surface of the land is disturbed and vegetation is removed by either natural forces or man's activities. Exposed, unprotected soil is then subject to rapid erosion by the action of wind or water. The erosive action of water can be separated into two categories: raindrop erosion is the result of the vertical force of falling water; sheet, rill, and gully erosion are the result of the horizontal force of flowing water. Both forces detach and move soil particles.

During construction, the Contractor is directed to comply with the precautionary measures provided in the contract documents, and to conduct his construction activities in such a manner as to prevent damage or impairment to the environment. It shall be the Contractor's responsibility not to undertake at any time, in any particular area, more than that magnitude of work which can be safely and adequately controlled by the forces at his disposal. Failure on the part of the Contractor to cooperate with the responsible person, whose responsibility it is to regulate the works set forth in the contract documents to successful completion, shall constitute grounds for suspension of construction activities of the contract. An emphasis shall be made to control erosion before it occurs. Upon completion of the project, no soil shall be left exposed (bare) in any of the construction areas of the Site.

### *Erosion and Sediment Control Plan*

To address the above issues, an erosion and sediment control plan has been developed which describes the potential for erosion and sedimentation problems on the project and explains and illustrates the measures which are to be taken to control those issues. The plan is implemented by the project contractor(s) based on requirements as shown on the construction drawings and technical specification, as well as requirements detailed in permits which become part of the contract between the owner and contractor.

### *Erosion and Sediment Control Techniques*

Erosion and sedimentation controls shall be employed to minimize erosion and transport of sediment into on-site and adjacent resource areas during the earthwork and construction phases of the project. The major erosion control techniques proposed include hay bale barriers, silt fence barriers, inlet sediment traps, a stabilized construction entrance, and erosion control matting. A detailed description of each technique is discussed below.

***Temporary Erosion Control Measures***

During construction and demolition activities, the following measures shall be employed to minimize the potential impacts to wetland and water resources within the project area from siltation and sedimentation. The Erosion Control measure are shown on sheet 4 of the site plans.

***Preservation of Natural Vegetation***

Natural vegetation shall be preserved on site where possible. This measure will prevent erosion by providing continuous anchoring of the soil.

***Drainage Swale Hay Bale Check Dams***

Hay bales shall also be placed across construction ditches during construction to limit the transport of sediment into drainage systems and waterways.

***Silt Fences***

Silt fences shall be placed at the limits of work where the slope is less than two percent. Typically, they shall be installed adjacent to resource areas, where soil will be exposed due to construction related activities, as depicted on the plans. It shall be placed in a sturdy, upright position and supported/anchored to withstand the forces of the elements and the circumstances of construction activities. The fence shall be installed in a manner that shall prevent runoff from passing over, under or around the fence (i.e. all of the runoff will pass through the fence). They shall be attached to posts (either steel or wood) in sufficient number to support the fence. The posts shall typically be placed 4 to 8 feet apart. It shall be the construction/demolition contractor's responsibility to maintain the fence in a functional condition throughout the duration of construction/demolition activities. The contractor shall also remove any large accumulations of sediment in a timely manner and dispose the material appropriately.

***Hay Bales***

Hay bales shall be placed, in conjunction with silt fences, at the limit of work on steep slopes only. Steep slopes for this project are those which are greater than two percent. The hay bales shall be staked with metal or wood stakes to anchor them to the ground. The contractor shall be responsible for maintaining the hay bales in good condition and replacing them as necessary. Bales that deteriorate and are no longer intact or that become plugged with sediment shall be removed and disposed. They shall be replaced with new hay bales installed as described above.

***Erosion and Sediment Control - Maintenance***

The project general contractor shall have primary responsibility for implementing temporary and permanent controls described in the plan and shall be responsible for assuring Contractor compliance with contract documents including all erosion and sediment control measures.

1. The on-site contractor shall inspect all sediment and erosion control structures weekly and after each rainfall event greater than one-half inch. Records of the inspections shall be prepared and maintained on site by the contractor.(Attachment B)

2. Silt shall be removed from behind barriers if greater than 6-inches deep or as needed to ensure the stability of the control device.

3. Damaged or deteriorated items shall be repaired or replaced immediately after identification.

4. The underside of hay bales shall be kept in close contact with the earth and reset as necessary.

Once construction in a particular area has been completed and the areas have been stabilized, these temporary devices shall be removed.

**ATTACHMENT B**

# INSPECTION AND MAINTENANCE REPORT FORM AND POST-AUTHORIZATION RECORDS

**STORMWATER POLLUTION PREVENTION PLAN**
**WEEKLY INSPECTION AND MAINTENANCE REPORT FORM**

**Inspector:_____Title_____Date:_____**

**Specific Site Location**:_____

**STABILIZATION MEASURES**

| AREA | INSTALLED? (Yes/No) | CONDITION OF STABILIZATION MEASURE |
|---|---|---|
| Silt Fences | | |
| Haybales | | |
| Stabilization for Stockpiles | | |
| Seeding and Planting | | |
| Geotextile Fabrics | | |

**STABILIZATION REQUIRED:**

_____

_____

_____

_____

**TO BE PERFORMED BY: _____ON OR**

**BEFORE:_____**

**Make note of the date and location of the following**:

•The start of grading activities

•Temporary or permanent cease of grading activities

•Implementation of temporary stabilization

•Implementation of final stabilization

_____

_____

_____

**STORMWATER POLLUTION PREVENTION PLAN**
**WEEKLY INSPECTION AND MAINTENANCE REPORT FORM**
**Continued**

Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;

_____

_____

_____

Weather information and a description of any discharges occurring at the time of the inspection;

_____

_____

_____

**Form A-III**

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP)**
**INSPECTION CHECKLIST - TO BE COMPLETED BY CONTRACTOR**

**Inspected By:_____, Title _____ Date:_____**

| YES | NO | DOES NOT APPLY | ITEM |
|---|---|---|---|
| | | | Are the BMPs called for on the SWPPP installed in the proper location and according to the specification of the SWPPP? |
| | | | Are all operational stormwater inlets protected from sediment flow? |
| | | | Do any erosion/siltation control measure require repair or clean-out to maintain adequate function? If yes, indicate which ones. |
| | | | Are on-site construction traffic routes, parking, and storage of equipment and supplies restricted to areas specifically designated for those uses? |
| | | | Are the locations of temporary soil stockpiles or construction materials in approved areas? |
| | | | Do any seeded or landscaped areas require maintenance irrigation, fertilization, seeding or mulching? |
| | | | Is there any evidence that sediment is leaving the site? |
| | | | Is there any evidence of erosion on cut or fill slopes? |
| | | | Is there any evidence of sediment, debris, or mud on public roads at intersections with site access roads? |
| | | | Notes: |
| Action to be Taken: | | | |

**APPENDIX C**

# PERMANENT STORMWATER SYSTEM OPERATION AND MAINTENANCE PROGRAM

# PERMANENT STORMWATER SYSTEM
# OPERATION AND MAINTENANCE PROGRAM

**PREPARED FOR:**

**RICHARD HOPPS**
**302 ELM STREET**
**DARTMOUTH, MA 02748**

**PREPARED BY:**

**PRIME ENGINEERING, INC.**
**P.O. BOX 1088**
**LAKEVILLE, MASSACHUSETTS**

**NOVEMBER 13, 2013**
**REVISED FEBRUARY 3, 2014**

# LONG TERM POLLUTION PREVENTION PLAN
# (PERMANENT OPERATION AND MAINTENANCE PROGRAM)

## TABLE OF CONTENTS



**Attachments:**

## 1.0 INTRODUCTION

The plans for the installation of a seven lot residential subdivision with a cul-de-sac roadway on Cardinal Street in New Bedford, MA have been designed to protect stormwater quality. In order for this to continue in the long term, it is necessary to implement the following long term Operation and Maintenance Program.

## 2.0 RESPONSIBLE PARTY

Responsible Party: Richard Hopps
302 Elm Street
Dartmouth, MA 02748

Upon completion of the development, Mr. Hopps intends on petitioning the City of New Bedford to accept the roadway as public. Prior to acceptance of the roadway, the City of New Bedford will be made aware of the presence of stormwater management systems and the requirement for proper operation and maintenance.

## 3.0 SOURCE CONTROL MEASURES

The most effective means of providing clean runoff is to prevent pollutants from coming into contact with the stormwater in the first place. This involves the following:

1. Keeping fertilizers, stockpiles, etc. covered at all times. All such products shall be stored off-site.

2. All landscaping, fertilization, and other grounds maintenance, if necessary, shall be performed by personnel who are trained at how to maintain the grounds.

3. Periodic removal of windblown debris and litter from the site.

## 4.0 MAINTENANCE OF STORM SYSTEM

The following sections present the routine, periodic, non-routine and non-periodic maintenance that must be completed.

## 4.1 Routine Maintenance

1. Mowing: The grass swales, top of the dike at the water quality basins and embankments are to be mowed at least once a year during the growing season. Grass is to be cut to a height no less than 4 inches.

2. Debris: All debris and litter are to be removed from all of the forebays, vegetated swales, water quality basins, in and around the control structures during regular mowing operations.

3. Re-seeding: Embankments that have excessive erosion or slumping are to be re-graded and seeded (with canary grass or tall fescue grass) during the spring or fall growing seasons, as needed.

### 4.1.1 Stormceptor Maintenance

The Stormceptor removes oil through the 6" inspection/oil port and sediment is removed through the 24" diameter outlet riser pipe. Alternatively, oil could be removed from the 24" opening if water is removed from treatment chamber, lowering the oil level below the drop pipes.

The depth of sediment can be measured from the surface of the Stormceptor with a dipstick tube equipped with a ball valve (sludge judge). Rinker materials recommends maintenance be performed once the sediment depth exceeds the guideline (900 Model = 8" (200mm) sediment depth).

No entry into the unit is required for routine maintenance of the inlet Stormceptor or the smaller disc insert models of the in-line Stormceptor. Entry to the level of the by-pass may be required for servicing the larger in-line models. Any potential obstructions at the inlet can be observed from the surface. The by-pass chamber has been designated as a platform for authorized maintenance personnel, in the event that an obstruction needs to be removed, drain flushing needs to be performed, or camera surveys are required.

Typically, maintenance is performed by the vacuum service industry, a well established sector of the service industry that cleans underground tanks, sewers, and catch-basins. Costs to clean the Stormceptor will vary based on the size of the unit and transportation distances. If you need assistance for cleaning a Stormceptor unit, contact your local Rinker materials representative, or the Rinker materials Stormceptor information line at (800) 909-7763.

## 4.2 Periodic Maintenance

1. All catch basin sumps, and the sumps at the storm water discharge outfall shall be inspected monthly and cleaned a minimum of once per year. In this cleaning, the entire contents of the sumps will be excavated.

2. Accumulated water quality basin sediment is to be removed every two (2) years. This operation may, in rare cases, necessitate the use of a small loader such as a bobcat and a small dump truck to remove the sediment build up in the forebay of the basin, however, the basis of the design is such that sediment be removed by hand shovel, be loaded into 5 gallon buckets and carried out on foot. Sediment build up around rip-raped outlets, debris catchers and in their sumps, shall be removed manually or by vacuum truck. All disturbed areas are to be re-seeded as appropriate with canary grass or tall fescue grass. Sediment removal should preferably be done during a dry period.

3. Regular Maintenance of the sediment forebay is required. Frequent removal of sediment will make it less likely that sediments will be re-suspended. At a minimum, the forebay shall be inspected yearly and cleaned as necessary.

## 4.3 Non-routine Maintenance

**Structural:** All headwalls, catch basins, grates and pipes should be inspected once every four (4) years for proper function, clogging, signs of deterioration and structural inadequacy. Any adverse situations are to be repaired as needed.

## 4.4 Non-periodic Inspection

The Storm Water Management System shall be inspected after two years of full operation by a registered professional civil engineer to confirm its adequacy. The inspection shall include an examination of all components of the system including forebays, vegetated swales, water quality basins, catch basins, and storm water outlets.

## 5.0 RECORD KEEPING

A maintenance inspection report will be made after each inspection. A copy of the Inspection and Maintenance Report Form to be completed by the inspector is included as Attachment B in Appendix B (Form A-III). Maintenance inspection reports shall be maintained by the owner for a period of no less than 5-years.

## 6.0 PUBLIC SAFETY FEATURES

The stormwater management facilities were designed to be inherently safe. All of the accessible stormwater controls (i.e., basins, forebays, swales, etc.) were designed with 3:1 side slopes to allow for pedestrian access in and out of the stormwater controls.

## 7.0 SPILL PREVENTION AND RESPONSE PLAN

The project consists of a road and retention basin which do not emit many pollutants. The only potential source of pollution is the grass cutting equipment which will be on site at the detention basin once or twice a year. The equipment will be fueled off site, therefore, there is little chance of a spill.

The Responsible Parties shall train all maintenance personnel in the proper handling and cleanup of spilled Hazardous Substances or Oil. No spilled Hazardous Substances or Oil shall be allowed to come in contact with stormwater discharges. If such contact occurs, the stormwater discharge shall be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose such contaminated stormwater. It shall be the responsibility of the Responsible Party to train all personnel in spill prevention and cleanup procedures.

In order to prevent or minimize the potential for a spill of hazardous substances or oil to come into contact with stormwater, the following steps shall be implemented:

a. A spill control and containment kit (containing, for example, absorbent materials, rags, gloves, plastic and metal trash containers, etc.) shall be readily available.

b. Manufacturer's recommended methods for spill cleanup shall be known and maintenance personnel shall be trained regarding these procedures and the location of the information and cleanup supplies.

c. It is the responsibility of the Responsible Party to ensure that all hazardous waste discovered or generated at the site are disposed properly by a licensed hazardous material disposal company. The Responsible Party is responsible for not exceeding hazardous waste storage requirements mandated by the EPA or state and local authority.

In the event of a spill of hazardous substances or oil, the following procedures must be followed:

a. All measures must be taken to contain and abate the spill and to prevent the discharge of the hazardous substance or oil to stormwater or off-site.

b. For spills of less than a quarter gallon of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

c. For spills greater than a quarter gallon of material, immediately contact Richard J. Rheaume, LSP, Prime Engineering, Inc., P.O. Box 1088, Lakeville, MA 02347 (508) 947-0050, Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill and proceed with prevention, containment and/or clean-up.

d. Spills of amounts that exceed reportable quantities of certain substances specifically mentioned in federal regulations 40 CFR 110, 40 CFR 117, and 40 CFR 302 must be immediately reported to the EPA National Response Center, Telephone (800) 242-8802.

The owner's representative shall be the spill prevention and response coordinator. He shall designate the individuals who shall receive spill prevention and response training. These individuals shall each become responsible for a particular phase of prevention and response. The names of these personnel should be posted in the material storage area and in the property office.

Any spill that occurs shall be documented on a spill report form that is enclosed as Attachment C.

## 8.0 SNOW AND ICE REMOVAL

Snow and ice shall not be removed, except for the main access road.

## 9.0 ESTIMATED OPERATION & MAINTENANCE BUDGET

The estimated annual budget to conduct the specified operation and maintenance is approximately six-hundred dollars per year ($600/year).

In addition, to limit the amount of pollutants, the application of fertilizer or pesticide to lawns is prohibited.

**ATTACHMENT C**

**Blank Spill Report**

**SPILL REPORT**

SITE ADDRESS:_____

NAME OF PERSON COMPLETING THIS FORM:_____

DATE:_____

TYPE OF MATERIAL:_____QUANTITY:_____

DESCRIPTION OF RELEASE:_____

_____

_____

_____

CIRCUMSTANCES LEADING TO RELEASE:_____

_____

_____

_____

_____

LOCATION OF SPILL:_____

_____

_____

_____

RESPONSE ACTIONS:_____

_____

_____

_____

PERSONNEL:_____

_____

ATTACH DOCUMENTATION OF NOTIFICATIONS AND CORRECTIVE MEASURES IMPLEMENTED TO PREVENT REOCCURRENCE

(COPY AS NEEDED)

**APPENDIX D**

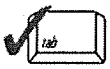
## CHECKLIST FOR STORMWATER REPORT

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands Program

# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands Program

# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

## Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature


Signature and Date

## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

# Checklist for Stormwater Report

## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

**Standard 1: No New Untreated Discharges**

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

# Checklist for Stormwater Report

## Checklist (continued)

### Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

**Standard 4: Water Quality**

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 4: Water Quality** (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

**Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)**

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

**Standard 6: Critical Areas**

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable**

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

**Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control**

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control** (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

**Standard 9: Operation and Maintenance Plan**

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

**Standard 10: Prohibition of Illicit Discharges**

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

**APPENDIX E**

# INTERIM ILLICIT DISCHARGE STATEMENT

## APPENDIX E

## INTERIM ILLICIT DISCHARGE STATEMENT

### 1.0 INTRODUCTION

The following is an interim illicit discharge statement based on existing conditions and design conditions. Once construction is complete, a final illicit discharge statement shall be issued to the Freetown Conservation Commission based on as-built conditions.

### 2.0 EXISTING CONDITIONS

The existing facility is an open area and woods. There are no known illicit connections in this area. No sources of illicit discharges were uncovered when this system was recently surveyed. Based on this investigation, to the best of my knowledge there are no current illicit discharges to the storm drainage system. If during construction, an illicit discharge is discovered, it shall be removed immediately

### 3.0 PROPOSED DESIGN

The proposed design calls for overland sheet storm flow. There are no points in the proposed storm drainage system where illicit discharges are likely to occur.

Certain types of discharges are allowable under the U.S. Environmental Protection Agency Construction General Permit, and it is the intent of the site's Long Term Pollution Prevention Plan to allow such discharges. These types of discharges shall be allowed under the conditions that no pollutants shall be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined in the Long Term Pollution Prevention Plan shall be strictly followed to ensure that no contamination of these non-storm water discharges takes place.

I hereby certify that the preceding is accurate.


Richard J. Rheaume, P.E., LSP
Prime Engineering, Inc.

## APPENDIX F

## TEST PIT LOGS

Project Location: Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-1 Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-8" | FILL | SANDY LOAM | 10YR 4/3 | 8" | GRAVEL BASE |
| | C | COARSE SAND | | | MED. TO COARSE SAND |
| | | | | | |
| | | | | | |
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Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: _____ Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 8"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 8 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.

Project Location: Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-2 Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-10" | A | SANDY LOAM | 10YR 4/3 | | |
| 10-22" | B | LOAMY SAND | 10YR 5/6 | | |
| 22-109" | C | COARSE SAND | 2.5Y 6/4 | REDOX @ 56" | STANDING WATER @ 93" |
| | | | | | |
| | | | | | |
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Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: 93" Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 56"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 56 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.

Project Location: Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-3 Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-12" | A | SANDY LOAM | 10YR 3/3 | | |
| 12-22" | B | LOAMY SAND | 10YR 5/6 | | |
| 22-97" | C | COARSE SAND | 2.5Y 6/4 | REDOX @ 43" | STANDING WATER @ 82" |
| | | | | | |
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Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: 82" Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 43"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 43 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.

Project Location: Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-4 Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-8" | A | SANDY LOAM | 10YR 3/3 | | |
| 8-23" | B | LOAMY SAND | 10YR 6/6 | | |
| 23-85" | C | COARSE SAND | 2.5Y 6/4 | REDOX @ 36" | STANDING WATER @ 66" |
| | | | | | |
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Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: 66" Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 36"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 36 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.

Project Location: Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-5 Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-10" | A | SANDY LOAM | 10YR 3/3 | | |
| 10-26" | B | LOAMY SAND | 10YR 6/6 | | |
| 26-88" | C | COARSE SAND | 2.5Y 6/4 | REDOX @ 50" | STANDING WATER @ 80"<br>COBBLES |
| | | | | | |
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Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: 80" Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 50"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 50 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.

Project Location Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-6A Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-12" | A | LOAMY SAND | 10YR 5/6 | | |
| 12-24" | B | SAND | 2.5Y 6/4 | | |
| 24-74" | C1 | COARSE SAND | 2.5Y 6/4 | REDOX @ 58" | |
| 74-110" | C2 | FINE SANDY LOAM | 5Y 7/2 | | WATER @ 95" |
| | | | | | |
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Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: 95" Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 58"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 58 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.

Project Location: Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-6B Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-12" | A | SANDY LOAM | 10YR 4/3 | | |
| 12-32" | B | SANDY LOAM | 10YR 5/6 | | |
| 32-86" | C1 | SAND | 10YR 5/6 | REDOX @ 34" | STANDING WATER @ 72" |
| 86-90" | C2 | FINE SANDY LOAM | 2.5Y 6/4 | | |
| | | | | | |
| | | | | | |
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| | | | | | |
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Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: 72" Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 34"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 34 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.

Project Location Proposed Cardinal Place Subdivision, Cardinal Street, New Bedford, MA

# On-site Review

Deep Hole Number TP-7 Date: SEPT. 27, 2013 Time: _____ Weather _____
Location (Identify on site plan)
Land Use VACANT, WOODED Slope (%) _____ Surface Stones _____
Vegetation _____
Landform _____
Position on Landscape (sketch on the back): _____
Distance from:

| | | | |
|---|---|---|---|
| Open Water Body | _____ feet | Drainage way | _____ feet |
| Possible Wet Area | _____ feet | Property Line | _____ feet |
| Drinking Water Well | _____ feet | Other | _____ |

## DEEP OBSERVATION HOLE LOG

| Depth from Surface (inches) | Soil Horizon | Soil Texture (USDA) | Soil Color (Munsell) | Soil Mottling | Other (Structures, Stones, Boulders Consistency, % Gravel) |
|---|---|---|---|---|---|
| 0-14" | A | SANDY LOAM | 10YR 3/3 | | |
| 14-32" | B | LOAMY SAND | 10YR6/4 | | |
| 32-94" | C | COARSE SAND | 2.5Y 6/4 | REDOX @ 61" | |
| | | | | | |
| | | | | | |
| | | | | | |
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| | | | | | |
| | | | | | |

Parent Material (geologic) _____ Depth to Bedrock: 0
Depth to Groundwater: Standing water in the Hole: _____ Weeping from Pit Face: _____
Estimated Seasonal High Ground Water: 61"

## DETERMINATION OF SEASONAL HIGH WATER TABLE

Method Used:
_____ Depth observed standing in obs. Hole: _____in. x Depth to soil mottles: 61 in.
_____ Depth to weeping from side of obs. hole: _____in. _____ Groundwater adjustment: _____in.
Index Well # _____ Reading Date_____ Index well level_____ Adj. Factor_____ Adj. Groundwater level

## PERCOLATION TEST

Date:
Observation Hole#
Depth of Perc
Start Presoak/Time @
End Presoak
Time at 9"
Time at 6"
Time (9"-6")
Rate (min/inch)

PERCOLATION TESTS WERE NOT PERFORMED

Witnessed by: Scott Turner, Nitsch Engineering

Performed by: Robert Forbes, Prime Engineering, Inc.